# COMPREHENSIVE PLAN FOR WATER SUPPLY AND ENVIRONMENTAL SANITATION FOR THE COUNTRY FOR THE NEXT TWO DECADES (upto 2000. A.D.)

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# C o n t e n t s



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# FORWARD

In this Report a review on the progress made on water supply and environmental sanitation in the country during the post-Independence era is discussed. The facts and figures quoted in this Report are mostly obtained from papers presented by several authors at various seminars, meetings, published papers, bulletins, etc. and not from official records only. As such there may be some mistakes and omissions which the author is very much aware of. The author also desires to express his limitation in producing such a comprehensive report on all aspects of development in such a vast field of environmental health in his individual capacity, without having resort to correspondence or personal dialogues with the various authorities concerned, who were actually responsible for planning and development in each sphere of activity.

Lastly, the author is aware that such a Report would also require visiting various places to get first-hand information and on actual seeing the conditions, better appreciation and appraisal could be made.

The Expert Committee may, therefore, review the statements made in this Report and correct, if there are any gross mistakes and add any important information that might have been lost sight of.

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# COMPREHENSIVE PLAN FOR WATER SUPPLY AND ENVIRONMENTAL SANITATION FOR THE COUNTRY FOR THE NEXT TWO DECADES (UPTO 2000 A.D.)

## CHAPTER 1

### 1.0 Historical Background :

The Health Survey and Development Committee more familiarly known as the Bhore Committee was the first to focus the attention on the then existing status of water supply and environmental sanitation in the country in 1946, the year just before the close of pre-Independence era in the history of the nation. While making a general observation on the environmental sanitation, they observed that "Environmental sanitation is at a low level in most part of the country and lack of education and health education add materially to the difficulty of overcoming the indifference with which the people tolerate the insanitary conditions around them and become apathetic to suffering from illness." The committee also noted that the insanitary conditions associated with rural and urban life in the country can to a large extent be mitigated if the individual feels a sense of responsibility towards his neighbour and that while the Indian home is kept fairly clean, the sense of responsibility of the average person in regard to community hygiene seems not infrequently to be conspicuous by its absence. Therefore, development of civic consciousness is essential if an improvement of environmental hygiene

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is to be effected and hence the importance of general and health education for creating civic sense cannot be over-emphasised.

The Health Survey & Development Committee drew a broad outline of planning for a national health service, both curative and preventive work, and including in the latter, plans for housing, village and town planning, water supply, disposal of human excreta, general sanitation, control of water pollution, control of insects, rodents and other vectors of diseases and control of dangerous and offensive trades. The committee made certain valuable recommendations on items like housing, water supply and sewerage etc., defining targets, programmes and financial implications. Soon after the country attained Independence, in June 1948, Government of India, in the Ministry of Health constituted another committee known as Environmental Hygiene Committee to consider steps to be taken to implement the recommendations of the Health Survey and Development Committee. This committee who studied the problems of environmental hygiene in greater depth and formulated specific plans and recommendations, taking into consideration of several constraints, submitted its report in 1949 which has become a classic today like the Chadwicks report, in England or the Shattacks report, in U.S.A. To be appraised of the then existing status of environmental hygiene and the

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proposed plans and targets by the Environmental Hygiene Committee, so as to enable us to measure the achievements and failures during the past 3 decades (1947-77), it is worth-while reviewing briefly the recommendations of the Environmental Hygiene Committee made in the year 1949 as this forms the base-line on which the achievements and failures could be judged more perspectively.

1.1 Housing :

While the Bhore Committee presented a vivid picture of the insanitary and over-crowded conditions of living in urban and rural areas, the Environmental Hygiene Committee presented a review of the problem in all its entirity, made a modest estimate of housing shortage based on projected population for 1951. Considering the problem to be more acute in towns and cities over 50,000 population and assuming a rate of growth of 5%, they estimated a shortage of 1.84 million houses and an additional one million houses for housing refugees, for the 1951 population. Since no Government can afford to undertake any large fraction of housing programme as a single enterprise, the participation of non-governmental agencies on a large scale was felt absolutely essential. Construction of houses at a rate of 5,60,000 per year and State-wise distribution of housing activity was suggested by the committee. The target set was 9,80,000 houses per year, of which 5,60,000 to be

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constructed during the 1st five years to meet the normal demand. Proper planning for the new housing schemes, setting up of 'satellite towns' and 'neighbourhood units' to relieve the congestion in the main cities and setting up of Housing Corporations were suggested, to meet the situation. It was proposed that the housing corporations would obtain land from Government on lease, develop housing sites, construct houses of standard design satisfying minimum needs of healthful housing and let them out at controlled rents based on a fair return on capital and area of accommodation. However, such housing schemes were not anticipated to cater to the poorer classes as they would not be able to pay economic rents even at 15% of their income. The committee also recommended that Government in big cities like Calcutta, Bombay, Delhi and Madras should provide quarters to at least 60% of their employees as against 5% existing at that time.

Industrial labour housing had always received special attention because the industrial labourers are generally poor and their contentment and welfare is important not only from the view-point of public health but also industrial production. While reviewing the several schemes that were formulated since the Report of the First Royal Commission on Labour (1930) and the latest step taken by the Government of India to implement the labour housing policy in 1949, according to which one

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million houses were envisaged in a period of 10 years, the Environmental Hygiene Committee streesed on the need for fixing minimum wages by law and the minimum wage to contain two distinct parts, one to cover the rental of a house and the other to cover food etc. It is only then the housing activity for industrial labour could be left to a public utility concern with Government control in the matter of profit and more than 50% of the housing needs of labour could be built by public housing corporation only by this approach. Even in labour housing project a mixed neighbourhood offered several social, hygienic and economic advantages than purely a reserved labour colony. The Environmental Hygiene Committee suggested that Cooperative Housing Societies should be encouraged by Government and assistance to these societies by way of supplying construction materials like cement and steel at controlled rates be provided to speed up construction and to attract more number of such cooperatives being set up all over the country.

The problem of slums and the deplorable insanitary conditions in which the slum dwellers live is a slur on human dignity. Recognising this fact the Environmental Hygiene Committee called for stoppage of further growth of slums, slum clearance with proper additional housing facility to accommodate displaced excess slum population and slum improvement as an interim measure to

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improve the living conditions in slums. A token grant of Rs. 4000/= per slum or bustee by Government for slum improvement schemes was recommended. A civic survey in all urban towns to assess the existing condition of housing and to assess the future needs was also recommended by the committee.

1.2 Rural Housing :

Both the Environmental Hygiene Committee and Bhore Committee recognised that the problem of village housing is not as acute as in urban housing. The problem of overcrowding is rarely present in rural house. But the buildings are defective from the point of view of ventilation, lighting, proper flooring, wall finish and lack of safe water supply, safe excreta disposal facility, etc. All new rural housing should be according to same standard as urban housing. The Governments through local authorities should enforce minimum standards. They should also assist with finance, advice in the improvement of existing houses through their health and other departments. Government should also produce and supply at controlled rates standard fittings, and construction materials like bricks, etc.

1.3 Town and village planning :

In order to implement housing projects in towns and villages, proper town and village planning is a prerequisite. Many of the existing towns have grown hapha-

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zardly in the past due to absence of planned development. Realising the need for planning for towns and villages many States (Provinces) had established town planning organisations prior to Independence. Some States had enacted Town Planning Acts and some had no such Acts. While reviewing the working of Town Planning organisations, Environmental Hygiene Committee recommended that every State should set up a State Town and Country Planning Organization with a trained State Town-Planner as the head. The State planner be authorized to scrutinise all housing development schemes and should advise the Government on the feasibility of the said project. Practising architects and town planners should also be licensed on the recommendation of the chief town planner of the State. Provincial (State) Housing Boards were recommended for undertaking housing schemes, with the chief public health engineers of the State as the Chairman. These boards being authorized to float loans and authorise Public Housing Corporations to engage in housing activity or engage themselves directly in the construction of houses. Regional planning around large metropolis was also one of the main recommendations. Zoning of the new townships with respect to location of residential areas, industries, commercial centres should be strongly enforced by suitable regulations and the location of an industry employing more than 100 workers should be decided by the State Public

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Health Engineers in the Public Health Engineering Department and not by the Chief Inspector of Factories as was in vogue. Although Improvement Trusts are instrumental for stimulating housing activity they only served upper middle class and tended to raise the value of land and increase in speculation in land to some extent. Provision of housing for poorer class became difficult where these tendencies operate.

1.4 Water supply :

At the time of Environmental Hygiene Committee Report, only 16% of the total number of towns in India had protected water supply which served 6-15% of the total population or 48.5% of the urban population. The per capita supply was also low ranging from 1 to 15 gals per day. Only 253 towns out of a total of 1471 towns in British India possessed protected water supply. Population served was 12.7 million or 48.5% of urban towns. Maintenance of these water works were also poor. They were run by untrained operators. No standard of water quality was maintained in any of the water supplies and there was only a few plant control laboratories for examination and analysis of water. Chlorination equipments were not maintained properly in smaller plants and no residual chlorine tests perfomed.

Rural water supply was mostly from wells, tanks, rivers and streams which were largely unprotected. The

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to entrust them with the responsibilities of planning, design and construction and maintenance of public health engineering works.

d. Plan for gradual extension of protected water supply to 90% of the population in 40 years.
Estimated annual expenditure towards the increased activity in water supply for Central Government was Rs. 5.05 crores and that for Provincial Governments 8.72 crores/ annum. Environmental Hygiene Committee also set detailed standards to be adopted in public water supplies.

Regarding material shortfall the committee recommended to set up more cast iron manufacturing factories of a total installed capacity of 12000 - 15000 tons per month. Similarly for increased production of steel pipe to meet an annual demand of 40,000 tons steel pipes, galvanised iron and wrought iron pipes to the tune of 15000 - 20,000 tons per annum. These factories tobe set up expeditiously within a period of 2 years. Chlorine supplies at that time was only 300 tons/annum as against increased demand of 800 tons/annum. Alum supplies were also of the order of 6000 - 7000 tons/annum. The demand was of the order of 12000 - 15000 tons and hence production of both chlorine and alum was also recommended to be stepped up.

As regards financing of these water supply schemes the Environmental Hygiene Committee recommended

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that the cost of both installation and maintenance of rural water should be borne by State Governments. The capital cost of urban schemes should be shared both by State Government and the local body. The maintenance should be entirely the responsibility of municipality.

The Chief Engineer (Public Health) in every State should have funds placed at his disposal for research and development works and research to be carried out in collaboration with teaching and research institutions to solve water supply problems and to find out more appropriate technology to suit the local needs.

1.5 Collection and disposal of community wastes :

In 1947 only 23 cities out of 48 having a population over a lakh had sewage system, of which 12 towns were partially sewered. Roughly 3% of the then population has served by sewerage system. The recommendations of the Environmental Hygiene Committee as regards sewerage systems were :

(a) Urgent improvements to existing sewerage systems and disposal works.

(b) Extension of sewerage to new housing developments and extension of city limits where there is already a sewerage system.

(c) Laying of sewers in all permanent pilgrim centres.

(d) Laying of sewers in all towns over a lakh

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population.

(e) Laying of sewers in predominantly industrial area.

(f) More complete utilization of sewers in sewered areas.

Cost of sewerage systems to be borne by the local bodies out of their own revenue from entertainment tax. Cost of sewerage systems to permanent pilgrim centres to be shared by State and Central Governments. With regard to complete utilization of sewers already existing or laid, the local body should insist the house owners to convert their service privies to connected ones and if they fail to do so, the local body should carry out these connections out of a loan to be advanced by the State Government and recover the cost as a first charge on the property tax. In unsewered towns, service latrines are not hygienic. Non-service type of latrines with a hygienic disposal of excreta at the site is to be preferred. Septic tanks are suitable for this purpose provided they are properly maintained and desludged regularly. Only where there is not enough land, soil absorption is difficult, the effluent can be allowed to be discharged into sullage drains. The committee strongly recommended controlled sewage farming to eliminate health hazards.

Solid waste disposal : As regards refuse collection and disposal, the committee pointed out that "wealth

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from waste" is not to be produced at the expense of health. Government should insist that even the smallest municipality should carry out refuse collection and disposal satisfactorily. Every municipality with a population over a lakh should have a well equipped workshop where transport vehicles, machinery for water and sewage could be repaired.

Environmental Hygiene Committee felt that although composting with human excreta is a good method of producing organic manure, the value and potentialities of composting human excreta have been overrated, while the accompanying dangers to public health have been overlooked. Composting was not advocated for municipalities with a population over 100,000. When cities over a lakh population are sewered, the nitrogen in the waste could be conserved for agricultural use by sewage farming wherever possible. In smaller towns, however, composting grounds should be located at least half a mile away from municipal limits.

1.5 Rural Sanitation :

For villages, the excreta disposal should be through non-service type of latrines, like bore hole, dug well, septic tank latrines. The programme to introduce latrines in rural homes needs leadership backed by an organisation for technical service. Rural Panchayats, social service organisations, schools and health centres, etc. are all means of reaching the villager. Rural

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Panchayats can play a significant role for improving rural hygiene and getting latrines built in rural areas if their activities are regulated and oriented properly. Public latrines are not to be favoured in rural areas for obvious reasons. The education of the individual is far more important than the mere provision of a latrine. The Environmental Hygiene Committee suggested that provision of water supply and spraying of DDT for malaria control are accepted needs of rural community and as such, this should be taken advantage to motivate villagers to provide latrines to their homes. Village Panchayat should take more responsibility for village sanitation. They should be given powers to insist that no new houses be built without a latrine. Health Centres should provide equipment to sink bore holes for latrines and supply latrine parts at no loss no profit basis.

Regarding materials for construction of sewerage, the Environmental Hygiene Committee recommended more factories to produce at least 3000 tons per month stone-ware pipes and sanitary fittings, galvanised iron pipes, etc. The committee recommended that refuse collection and disposal which in the majority of municipalities is carried out by Health or Vehicle Department, should be managed by the municipal engineering service with trained public health engineers.

Sewage treatment plants should be operated by trained

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operators. In large treatment plants, a control laboratory with trained analyst should be provided.

Mechanisation to the extent desirable be introduced in all aspects of waste collection, transportation and disposal.

1.7 Food Sanitation :

In in recommendations regarding food sanitation were :

1. Strict sanitary control in licensing and running food preserving establishments by the local body and adequate provisions in the municipal bye-laws.

2. Health certification and routine check up of food handlers.

3. Establishment of municipal slaughter house and elimination of private slaughter houses.

4. Establishment of modern dairies.

5. Removal of khatals and providing sanitary cow-sheds for the cattles displaced from khatals.

6. Building of storages strictly according to sanitary requirements.

7. Checking restaurants, canteens and other eating establishments for sanitary provisions.

1.8 Pollution of Streams, Lakes and Beaches :

Even three decades ago the Environmental Hygiene Committee was aware of the water pollution problem arising out of discharge of sewage and industrial wastes without any treatment. The committee recommended that

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sewage and industrial wastes should be treated to the extent necessary to adjust the pollution load to the simulative capacity of the receiving body of water for self purification. They also recommended that the pollution status of each water course be assessed to determine its self purifying capacity. Further it was also recommended that the proposed water and drainage boards by the Health Survey and Development Committee can involve itself in conducting stream surveys and carry out research in the field. The committee also recommended that State Public Health Act should contain provision to enforce treatment of wastes before discharging into receiving waters. They considered that it has not been expedient to present any effluent standards by legislative enactment but they recognised theneed for investigation of all pollution sources. They called for co-ordination between Ministry of Labour and Ministry of Health in the matter of industrial waste treatment. Inter-State pollution problems were proposed to be solved by mutual discussion between States and Central Ministry of Health should act as arbitrator.

1.9 Organisation and Administration :

The Environmental Hygiene Committee's main recommendation was that, both at the Centre and in the States, there should be a strong Technical Organisation which will be constantly at work to make use of every opportu-

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nity to improve environmental hygiene and whose special responsibility will be to ensure that recommendati ons made by Environmental Hygiene Committee are carried out. Such an organisation was not there in Centre in 1949 and many of the States. It, therefore, encisaged setting up of separate Public Health Engineering Department in each State under the Ministry of Heal th and at the Centre, a Consulting Public Health Engineer attached to Ministry of Health as an Adviser. The Chief Public Health Engineer of each State should have Headquarter staff for design, investigation and research etc. and with executive field staff for construction, operation and maintenance. Environmental Hygiene Committee also recommended that services of municipal engineers and plant operators to be brought under the State cadre. It also recommended a comprehensive Public Health Act to be passed in each State and a legislation to ensure that local bodies perform elementary functions of environmental hygiene to the standards prescribed. The committee strongly recommended increasing financial sources of the local bodies to increase the revenue from Rs. 3/= to Rs. 13/= per capita per annum so as to enable them to improve environmental hygiene.

1.10 Training of Personnel :

In order that a strong Public Health Engineering organisation be developed in each State, the committee

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felt that organisation of training programme is absolutely essential. They recommended that the Central Government should assume the responsibility for training personnel required for improving environmental hygiene. Different catagories of personnel required as envisaged by the committee were :

(a) Public Health Engineers,
(b) Public Health Engineering Subordinates,
(c) Town Planners,
(d) Plant Operators,
(e) Medical Health Officers,
(f) Sanitary Inspectors,
(g) Specialists on Sanitary Chemistry,
and (h) Industrial Hygienists.

The Centre should be responsible for training high grade personnel for at least 10 years and public health engineers training should be open to all engineers and not only restricted to civil engineers. At the time of report only All India Institute of Hygiene and Public Health, was offering both a Master's degree and a certificate course and as such, the committee recommended that more training centres be opened as and when demand increases. The committee did not favour specialisation at under-graduate level.

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## CHAPTER II

### 2.0 Progress in Water Supply and Environmental Sanitation for the past 3 decades (1947-77) :

The status of water supply and environmental sanitation as identified by the Bhore committee and Environmental Hygiene Committee could be considered as the baseline on which progress madeduring the past 3 decades be measured. A review of the findings of the Environmental Hygiene Committee is already presented in the previous chapter.

As a part of the post-war reconstruction activities some of the States initiated their five year plans in which provisions were included for implementation of urban and rural water supply and sanitation schemes. Mention could be made of the lead given in this direction by princely States like erstwhile Mysore where some tangible progress was made in this direction but most of the States came up against formidable obstacles in the way of raising the finances for such schemes, building up of organisations and procurement of proprietory materials for such schemes.

Then came the First Five Year Plan (1951-56) of the National Government. In the initial stages of the plan, provision for water supply and sanitation schemes in the State was made from the fund under the Community Development works and Local Development works included

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in the plan. There was, however, no Central direction or leadership provided in the matter. In 1953, in response to a circular enquiry from the Union Health Ministry, the information was elicited from all the State Governments that they were unable to make any headway in regard to their water supply and sanitation schemes due to lack of finance, trained personnel and shortage of materials as already mentioned. The States also expressed the desire that Centre must step into the picture and announce a programme of assistance to help the States to proceed with such schemes.

2.1 National Water Supply and Sanitation Programme :

As a result of the desire of the States that Centre should provide assistance to the States to implement water supply and sanitation schemes, it was in August-September 1954, that the Union Health Ministry announced the National Water Supply and Sanitation Programme as a part of the Health schemes under the plan. In April 1954, the Government of India and the Government of U.S.A. signed an agreement authorising financial support for water supply development and sanitation. The agreement provided for the establishment of a Central Public Health Engineering Organisation in the Ministry of Health, the training of sanitation personnel, the procurement of equipment, supplies and materials from outside India and providing consultancy service in connection with

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National Water Supply and Sanitation Programme. A Central Public Health and Environmental Engineering (C.P.H.E.E.O.) organisation was established during late 1954, with a nucleus of staff with a Deputy Director General (Public Health Engineering) as Head of the organisation under Director General of Health Services. The same organisation has now been expanded with an Adviser in Public Health Engineering as the Head and is functioning in the Ministry of Works and Housing and Urban Development. This organisation is responsible for coordinating activities of the States in the development of water supply and sanitation in the State and to carry out the national programmes in water supply and sanitation, both in the Central sector as well as in the State sector. Besides, it has also assumed responsibility for developing training programmes to meet the increasing demand in man-power due to increased developmental activity in the field of environmental health from time to time. It also acts as the clearing house for the loans and grants sanctioned to States under the National Water Supply and Sanitation Programme incorporated in the five year plans of the nation.

National Water Supply and Sanitation Programme envisaged the granting of long term interest bearing loans returnable in 30 instalments for undertaking water supply and sanitation schemes in urban areas. Rural projects

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approved under the programme would receive 50% grants and 50% loan from the Central Government. Scope of the rural scheme was restricted to financing of more difficult schemes involving piped water supply to a group of villages. In the initial stages, however, piped water supply to individual villages were also included. Only villages with less than 5000 population were covered by the grants.

The scheme was in operation for only 18 months during the first five year plan period and merely saw the introduction of the programme. During the second five year plan period, although better progress could be achie ved, many constraints for the speedy implementation of the scheme was noticed. Lack of a separate organisation with trained public health engineers, standardisation in design, delay in processing the schemes, shortage of supply of materials, such as, pipes were some of the main bottlenecks that delayed the progress of schemes undertaken. Besides, there was no comprehensive concept of the overall magnitude of the problem both in urban and rural sectors. In 1958, the third conference of public health engineers made a first ever attempt to make an overall assessment of the problem that too only in financial outlays and emphasised the need for a comprehensive planned programme to cover both urban and rural phases within a specified period as envisaged by the Environmental Hygiene Committee. It was also felt by this group, if targets have to be set

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and goals reached there is need for radical reorientation of the present policy in regard to financing and management methods for a total programme. The conference resolutions stimulated re-thinking on the part of local bodies, administrators and engineers. Subsequent meetings of Central Council of Health, Local-Self Government Ministers' conferences, Mayor's conference, conveyed by Health Ministry although considered the problem in a new angle but still leaning heavily on the Central Government for financial help and technical guidance for implementing the programme.

2.2 Committees and Panels :

In the year 1960, Government of India, called upon a three member T.C.M. team to make a ritical evaluation of the programme and make recommendations for expediting and improving the programme. The team after a short visit made a critical review and submitted a report dealing with socio-economic and public health significance of the programme and made notable recommendations regarding organisation, administration, tax structure, legislation, training facilities and related problems for streamlining the programme for its speedy execution. A summary of these recommendations was presented in Chapter VII of that report, some of which are worth-while considering even now particularly in rural sanitation where no tangible progress has yet been made even after five 5 year plan periods.

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In the first five year plan, there was recognition of the problem and a very modest start on construction. The second five year plan witnessed the emergence of public health engineering profession as the most important factor in the success of the programme. Many States who had no seperate public health engineering organisation started setting up of a seperate department of public health engineering. Training and research programmes were initiated. A detailed review of development of training and research is given in a seperate paragraph elsewhere in this report. A considerable expanded programme was undertaken. But still provision of water supply and sanitation was given a low priority in the national planning even towards the end of the 2nd five year plan.

During 1959-60 a critical review of the National Water Supply and Sanitation Programme was also made by a Panel of Public Health Engineers appointed by the Planning Commission. The panel has discussed the reform necessary to ensure better progress within the limitations of the existing administrative set up and financing methods and indicated broader policies to expand the programme into greater dimensions and place future operations in the field on a self-generated momentum.

Notwithstanding recommendations of the above two expert committees, Government of India in the Ministry of Health constituted yet another committee in April 1960,

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known as Simon Committee to make a comprehensive assessment of the urban and rural water supply and sanitation problem and make recommendations for a realistic approach to fulfill the needs. The committee in its report submitted to Government in 1961, reviewed the progress upto the end of second plan, made an accurate assessment of the problem, identified lacunae in the programme, and made notable recommendations regarding organisation, financing with special reference to the tax structure and revenue potential in the urban areas and also the question of training, and research as a part of the problem of the organisation of the different States. The committee stressed the need for an immediate survey and investigation and ascertaining correct data on the existing conditions both in urban and rural areas on which future planning and implementations could be based for successful results. The committee tried to collect the data by circulating a proforma but could not get adequate response from the States as the States themselves were in darkness and did not know the magnitude and nature of the problems. An approximate forecast of funds required to complete the water supply and sewerage schemes in all urban and rural areas based on 1961 population made by the committee put the figure at Rs. 950 crores for urban and Rs. 200 crores rural for providing minimum drinking water supply. The committee strongly felt that minimum drinking water be

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provided to all villages in the country at least by the end of the 3rd plan period, as an important and essential step in the nation building programme. A high power National Committee on Environmental Planning and Co-ordination was set up by the Central Government in 1974 to work out a broad policy on environmental planning and to coordinate several developmental activities, keeping in view the importance of maintaining an ecological balance. This committee reviews from time to time major develpmental projects and its importance on environment.

In May 1964 the Union Health Ministry organised a Seminar in collaboration with W.H.O. on financing and management of water and sewage works. This seminar was the first of its kind attended by a large number of experts, consisting of State public health engineers, Mayors and Commissioners of local bodies, experts from planning organisations like Planning Commission, Calcutta Metropolitan Planning Organisation, Professors in Public Health Engineering, Administrators from Water Boards, etc. The participants, once again, stressed the need for according a very high priority for water supply and sewerage schemes in nation building programme, perspective planning, setting up of water and sewage boards in each State as a combined utility concern, who could function independently and be able to work out the schemes on a self-financing basis

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and tap all sources of financing the schemes by sale of bonds, debentures, etc., loans from public financial institutions, international and bilateral agencies, such as, World Bank, I.D.A., U.S.A.I.D., etc. and also setting up of Municipal Financial Corporations. They also stressed the need for augmenting training facilities for all categories of personnel required to execute and maintain water supply and sewerage schemes, and augmenting production capacity for proprietory materials and equipment to meet future demand and to save foreign exchange.

Subsequently also a large number of meetings, seminars, workshops are being held in the country from time to time, both at national and international levels, on various aspects of water supply and environmental sanitation and the list is an exhaustive one to recapitulate in the limited space in this report. Several recommendations have been made to accelerate the programme for providing water supply and environmental protection to the entire population of the country. But, due to varied causes, by and large, much of these thoughts and suggestions given by expert groups have remained unfulfilled even today after a lapse of three decades since Independence. A brief resume of the main progress that are significant but not spectacular on different aspects of environmental sanitation is presented below with facts and figures.

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2.3.1 Water Supply :

(a) Urban : Table 1 below depicts the coverage of urban population, both number-wise and population-wise. As per 1971 census, there are 3119 towns having a population of 109 million people.

Table - 1. Coverage of water supply in Urban Towns in 1977

| Class of Town | Population range | Coverage by water supply | |
|---|---|---|---|
| | | By number % | By population % |
| I | 1,00,000 | 100 | 100 |
| II | 50,000 - 1,00,000 | 83 | 60 |
| III | 20,000 - 50,000 | 87 | 60 |
| IV | 10,000 - 20,000 | 80 | 60 |
| V | 5,000 - 10,000 | 37 | 37 |
| *VI | 5,000 | 38 | 38 |

*Urban villages

/x/ State-wise coverage of urban water supply, consumption rates, percentage served by house-taps and street hydraunts is shown in Appendix - A.

Although the above Table conveys a sense of significant progress in the field of urban water supply, yet one would reckon the common incidents in majority of towns, such as, long queues at the public stand posts, frequent occurrance of outbreaks of cholera and other water-borne diseases, uncertain and intermittent supply forcing people

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to hoard water supply to spill that precious treasure when the next supply is resumed etc., one would not feel that sense of satisfaction. There are many inadequacies in these supplies, such as, partial coverage (both in population and spatial), low per capita supply, inefficient and ill-maintained distribution systems, intermittent nature of supply leading to wastage and contamination, unskilled operation of treatment plants leading to frequent breakdowns and substandard quality of supply, etc. But, there are also some bright spots in the progress on urban water supplies. The age-old concept that water is a free commodity and it is the responsibility of the exchequer to provide this commodity free of cost to all citizens is gradually changing. With the setting up of water supply and drainage boards in some of the major cities and towns, who are working on the basis of self-supporting, people are now more willing to pay for the water that is supplied to them than before. Metropolitan Development Authorities set up in major cities of Calcutta, Bombay, Madras and Delhi have taken up comprehensive schemes to develop sound water supply systems for the whole of the metropolitan area which was hitherto attended to on a fragmentary basis. Calcutta is augmenting its water supply to 300 MGD by putting up two more large treatment plants. Bombay Municipal Corporation has completed the first integrated water supply and sewerage

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project costing Rs. 203 crores with the aid of World Bank where 40% of the total capital expenditure was met by surplus of revenue over the operating expenditure, which proves that change in approach is possible elsewhere also. They propose to apply similar principle of self-dependency in executing the massive second phase of the project costing Rs. 350 crores. Tamil Nadu Water and Drainage Board at Madras has augmented its water supply by executing Veranam project and are considering to bring water from Krishna river from a distance of 100 km. Karnataka State executed first phase of Cauvery water supply scheme to bring water to city of Bangalore from a distance of 60 km from river Cauvery. Similarly other towns and big cities also have augmented water supplies but even with the increased supplies, the supplies are not satisfactory both quantitatively as well as qualitatively due to population explosion in urban centres. Most of these plants are not managed efficiently for want of trained personnel and attractive remuneration for the operating staff.

Some States like Madras, Karnataka, have set up Urban Water Supply & Drainage Boards, with statutory powers to raise funds to execute and maintain water supply schemes to urban towns, other than major cities and metropolitan areas. The progress made by these boards are yet to be assessed more rationally to evaluate whether they are able to undertake the schemes financially viable.

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(b) Rural : Although rural water supply received the attention since the launching of five year plans, it was given an emphasis only during the 4th plan period when accelerated rural water supply scheme was launched in 1972. During the 5th plan, rural water supply formed an integral part of the minimum needs programme. According to a survey conducted by States the present status of water sources in the villages in the country is as shown in Table - 2 below.

Table - 2 : Status of water sources in villages in India.

| Nature of water source | Number of villages |
|---|---|
| Adequate but with pollution risk | 2,14,000 |
| Inadequate, unprotected | 1,85,000 |
| *Problem villages | 1,53,000 |
| Adequate, quality acceptable | 63,855 of which 40,000 are problem villages covered during the plan periods. |
| | 5,75,855 |

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Table - 3 : *Problem villages

| | Numbers | Population (1971) |
|---|---|---|
| (a) Villages with water sources more than 50' deep and more than one mile distance. | 91,181 | 74.8 million |
| (b) Cholera endemic villages. | 33,857 | 24.1 million |
| (c) Guinea-worm infested villages. | 3,184 | 1.8 million |
| (d) Villages with other health problems. | 24,778 | 21.9 million |
| Total : | 1,53,000 | 122.6 million |

It is estimated that hardly 64,000 villages have been provided with safe drinking water supply facilities covering approximately 10% of the rural population to the end of March 1977. The reasons for this poor coverage are manifold as pointed out earlier by various committees set up by the national Government. Firstly, water supply and environmental sanitation did not receive the due priority in the national planning. There is no unitary agency even now to provide this vital service in the rural area. At present, rural water supply is carried out, at least, under four different programmes, namely, National Water Supply and Sanitation Programme, Community Development Programme, Local Development Works Programme, and Programme for the Welfare of Backward Classes, without any coordination, with the result that the efforts got diffused over a wide range.

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There is no long range planning for lack of accurate asse-ssment of the magnitude of the problem even today. Priorities were not drawn up in the earlier plan periods. Only by the end of fifth plan a fair knowledge of the nature of problem and categories of villages exposed to high risk and low risk is available. Plan allocations although increased stepwise from plan to plan was too meagre to solve this gigantic problem. Material resources were also limited and needed augmentation. A proper infra-structure for an integrated development of water supply and sanitation in the rural areas is yet to be developed. The schemes executed so far consisted of both piped water supply schemes and tubewell with handpump schemes in rocky areas using fast rock drilling rigs, hand pump schemes in coastal and other plain areas and protected sanitary wells in rocky strata. UNICEF- aided the rural water supply schemes during fourth and fifth plan periods to the tune of 20 million dollars by way of supply drilling rigs, accessories and spares. They have supplied more than hundred fast drilling rigs to sink tubewells in hard rock areas. UNICEF-aided rural water supply projects have been executed in the States of Uttar Pradesh, Tamil Nadu and other States. Handpumps, according to a new design called India Mark - II, is also being supplied by UNICEF to harness tubewells in these projects. It is

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estimated that only 40,000 of the problem villages have been provided with water supply so far leaving a big gap of 1,33,000 yet to be covered.

Realising the importance of protected water supply to the rural population to increase productivity the National Govornment allotted high priority in the planned programmesfor development of rural areas and declared a 100% financial assistance for the current year (1978-79) to cover as many villages as possible during the rolling sixth five year plan period. The programme also provides for setting up of monitoring cells in the States for evaluation of the progress and reporting to Centre. Besides investigation units for accelerated rural water supply programme, in all States are to be set up with 100% assistance from Centre for preparation of water supply schemes for problem villages. In order to extend the benefits to a large number of villages as possible, it is also proposed to reduce the design standards regarding period of design, per capita supply and restrict supply only through public stand posts and discourage house connections. It is hoped that during the sixth and subsequent plan period rural water supply schemes will be executed on a massive scale and would strive to reach the target of providing drinking water supply to all countrymen, by 1990, as declared by United Nation to observe 1980-1990 as "International Drinking Water Supply and Sanitation" decade.

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2.3.2 Sewerage and Sewage Treatment : Progress with urban sewerage and sewage treatment is distressing. Hardly 217 tons are partially sewered covering about 34% of urban population. The existence of sewage treatment plants may be counted in fingers. Table 4 below presents the present status of coverage of towns by sewer systems.

Table - 4 : Coverage by sewerage

| Class of Town | Coverage by sewerage | |
|---|---|---|
| | By number % | By population % |
| I | 50 | 26 |
| II | 50 | 6 |
| III | 10 | 1.7 |
| IV | 0.6 | 0.3 |
| V | - | - |
| VI | - | - |
| | 217/3119 | 37/109 = 34% |

The reason for such low progress in the past is, lack of approach looking at water and sewerage services together, setting up of water and sewage boards to provide these two services on self-supporting basis, finding out new avenues of financing and maintaining the projects and above all lack of motivation at all levels that development of sewerage systems should proceed hand in hand with water supply systems if preventive health care of the people is to be successful.

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2.3.3 Conservancy system : Even among the towns that have sewerage system, many are partially sewered. A parallel conservancy system has to serve the bucket privies in the unsewered pockets of such sewered towns. It was, however, an evil genius who devised this bucket system in which groups of down trodden human beings make a house to house collection of human excreta in baskets and buckets, carry them on head, on the shoulder or in the hand, deposit the night-soils on road-side and reload on to night-soil containers, carts for final disposal by trenching or composting.

A survey conducted by the National Sample Survey (NSS) organisation in 1973-74* revealed that one-third of urban house-holds had no latrine whatsoever, the percentage being 40 or more, in nine States and two Union Territories and around 15 in West Bengal and Assam. Another one-third of the urban house-holds had bucket service latrines. In the case of remaining 33 1/3% of urban house-holds, 7.2% had flush latrines connected to sewer systems, 21% shared community flush latrines and 5.7% had exclusive use of septic tank latrines. In effect, out of 120 million urban population or 40 million house-holds, 7 million house-holds have no latrines and use open ground for defecation. There are nearly 2.5 crores of latrines in India and in Gujarat alone there are 1,86,000 bucket latrines.

* 'Sarvekshana' Journal of the N.S.S. Organisation, Government of India, Vol. 1, No. 2, October, 1977.

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Table - 5 gives distribution of latrines in the major States of Punjab, Bihar, Madhya Pradesh, Karnataka and Orissa.

Table - 5 : Distribution of latrines in some States.

| State | No. of house-holds. | Av. house-hold size. | Latrines | | | |
|---|---|---|---|---|---|---|
| | | | Water borne. | Service. | Others. | Total |
| Punjab | 3,56,933 | 5.31 | 18,468 | 2,47,559 | 9,189 | 2,75,216 |
| Bihar | 4,66,078 | 5.44 | 1,01,846 | 1,33,655 | 9,659 | 2,45,160 |
| Madhya Pradesh | 5,61,801 | 5.16 | 43,496 | 94,535 | 43,489 | 1,81,520 |
| Karna-taka | 6,85,562 | 5.45 | 26,441 | 57,668 | 6,149 | 90,258 |
| Orissa | 1,57,519 | 4.85 | 38,858 | 40,553 | 350 | 79,761 |
| | | | | | | 5,73,970 |

Source : Town Directory of respective States - Census 1971.

The existence of of a large number of bucket latrines and the most unhygienic and inhuman manner in which the night-soil is collected and conveyed and the uncontrolled methods used for disposal are the root cause for high prevalance of gastro-intestinal, diarrhoeal and parasitic infections in the cities and urban towns in the country. In some towns, even with improved water supply systems, the morbidity and mortality rates due to these diseases have not decreased because of lack of proper collection and disposal of night-soil. The most satisfactory system to deal with this situation is provision of flush latrines (with adequate water supply), extension or provision of new underground sewerage system and disposal of

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sewage after treatment. This is hard to achieve in all towns and cities within the foreseable future because of large financial outlay required to provide sewerage systems to all the remaining towns in the country. Even a modest estimate to provide complete sewerage systems and treatment works for all the 142 towns with more than one lakh population, will cost Rs. 600 crores. But, to cover the remaining 2974 towns the cost will run into several thousands of crores. Obviously we cannot reach the goal of sewerage systems to all towns even beyond 2000 A.D.

The Report of the Backward Class Commission was the first to bring to the notice of the Union Home Ministry in October 1956 the miserable condition of scavengers (Bhangis), their poor living condition, hand collection and head carriage of night-soil which is a slur on human dignity. The Malkani Committee Report which followed, recommended elimination of manual handling with the welfare objective of "Dhangi Mukti" and a 'cleaner' operation by providing gloves, gumboots, collection implements, covered buckets, wheel barrows for which Government financial aid was provided through the sixties. The strategy, however, practically failed to have any impact. Essentially it was a treatment of the symptom rather than the disease.

Gandhi Centenary provided the emphasis on total elimination of scavenging system. On July 19th, 1967,

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Government of India declared a scheme with 25% subsidy for 'conversion of dry latrines into water seal flushed latrines' and their connection to public sewers. One year later Government of India announced a special campaign to achieve maximum success. The subject received more specific attention in 1975 under Centrally sponsored scheme with 100% grant assistance and envisaged setting up pilot projects in 30 selected towns with a range of population 20,000 to 50,000. A symbolic provision of Rs. 4.4 crores was made in the fifth year plan for the pilot projects. The projects are in progress in 30 towns in nine States. Besides, Calcutta Metropolitan Development Authority, Calcutta, launched the conversion scheme in 1974, in slum areas and so far about 40,000 dry latrines have been converted to flush latrines. Even if we assume that all the projects are successfully completed under the Central scheme, it hardly touches the fringe of the problem.

On the other hand, more spectacular and pioneering work is being carried out by the social organisations in some States. Prominent among these are the Safai Vidyalaya in Gujarat and Sulab Shauchalaya Sanstan in Bihar. In Gujarat where 3,25,000 houses are having bucket latrines, the programme was started in 1969 by the Gujarat Government. The Directorate of Social Welfare with an Honorary Adviser carries out the programmes. Loans and

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grants are provided to local bodies, Nagar Panchayats and Gram Panchayats. Safai Vidyalaya, a voluntary organisation, carries out the training programme for all categories of staff involved in the programme, viz., sweepers, overseers in the block, sanitary inspectors of primary health centre and social workers engaged in Bhangi Kasta Mukti Programme. So far to the end of 1977-78, about 1,31,236 dry latrines have been converted to water seal latrines both in municipal as well as in panchayat areas at an expenditure of approximately 27.5 lakhs of rupees. This covers more than 70% of the dry latrines in urban towns and the programme target of converting the balance 50,000 latrines by October 1978 is sure to be reached. Safai Vidyalaya has played a key role in speeding up the programme, by promotional activity, liasion with local bodies guiding and moritoring the programme activity. This close association and active involvement of a non-official social agency has added a special dimension to the programme and has helped to strengthen and supplement departmental activities in crucial areas of programme implementation.

In Bihar, Sulabh Sauchalaya Sanstan (SSS), a product of Gandhi Centenary Committee registered in Patna in 1970, provided the catalytic influence which eventuallay led to a State-wide Government programme of latrine conversion. The SSS carries out the entire programme

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right from house to house survey till the completion of conversion work and even maintenance and follow up later. Government pays 50% grant and 50% loan to the house owner, through the local body. The voluntary organisation has built up a strong task force. Over 50,000 dry latrines have been converted to water seal latrines during 1974-78 in various towns in Bihar and another 33,180 were completed by June 1978 and the major towns of Ranchi and Patna will soon achieve the goal of Bhangi Mukti.

Besides these two voluntary organisations, who have played a pioneering role in improving sanitation in towns and cities, in Madras the RcA project at Poonamalle was implementing in 1974, a programme of conversion of dry latrines into water seal sanitary latrines in selected panchayat areas of Chingleput, Thanjavuur, Madurai and Tirunelveli districts and by October 1976 about 6000 latrines were converted. The Rajasthan Government have initiated a similar scheme in 1977 and have set a target of conversion of one lakh latrines in each year with provision of Rs. 300 per latrine in the municipal budget. The mechanics and working details of the programme is yet not known and a doubtful aspect is the capability of municipal administration to shoulder the financial burden. A scheme in Kerala was launched at about the same time. The Kerala Government made it compulsory on local bodies to get all bucket latrines converted. By the end of Gandhi

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Centenary year, 15 out of 25 municipalities, 3 corporations in the State had reportedly eliminated scavanging service. But in all these programmes provision of sanitary latrines to house-holds who has no latrine and whose number was equal to that of house-holds with bucket latrines did not receive any attention. Therefore, there will remains a large percentage of population to be covered by a programme for hygenic disposal of night-soil in the urban areas.

2.3.4 Rural Sanitation : A large percentage of the rural population are economically poor, educationally backward, and socially not well organised. Besides, there are wide variations of soil, climate, physiography, culture, attitudes and customs of the people which make the problem of excreta disposal more complicated and different from region to region. During the past three decades, expert committees have stressed the need for an integrated water supply and sanitation programme, yet no significant progress has been made in rural sanitation. Perhaps, it is the most neglected programme so far. Country-wide net-work of community development blocks with primary and secondary health centres have been set up. One of the primary responsibilities of these blocks and health centres under the preventive health care and social welfare programmes is promotion of sanitary latrines to rural homes. But, achievements are spherodic in nature. Neither the overseer of the block nor the

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sanitary inspector and other peripheral health workers of the health centres, have any time to spare to carry out latrinization programme with the result, there is hardly any improvement in the situation regarding excreta disposal in rural areas. Even today only about 2% of the rural population are provided with sanitary latrines. There is no concerted effort made either by Centre or by States to improve the conditions during the past three decades. Of the many social organisations and philanthropic institutions, who are engaged in this programme, mention could be made of Sevagram at Wardha, American Friends Services, American Mission at Barapalli, etc. Among the public health authorities, the All India Institute of Hygiene and Public Health under the Central Ministry of Health, National Environmental Engineering Institute, PRAI under the Government of Uttar Pradesh, Gandhigram at Madurai have been working on this problem for the past 3-4 decades. Many research and extension programmes have been carried out by these organisations during the past 3 decades. Important among these is the Research cum Action project carried out by the Ministry of Health, during 1957-60, with the assistance of Ford Foundation, at three centres, viz., Singur, Najafgarh and Poonamali. As a result of this intensive study for 3 years, material and methodology have been worked out to launch a programme for rural latrines. A WHO aided pilot project on environmental

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sanitation in rural area was also carried out by the Public Health Engineering Department of Kerala Government in 1957-58. Subsequently some extension projects are being carried out in the States of Madras, Kerala, Uttar Pradesh and Maharashtra. Another extension project is now being carried out by the State of Andhra Pradesh at Kareem Nagar in collaboration with National Environmental Engineering Research Institute. This is an integrated development project bringing about all round uplift of the rural communities, in which not only Government agencies but also voluntary organisations, industrial groups have joined hands.

A scheme for utilising waste to produce energy to meet the energy requirements in villages was first initiated by the Khadi Gramodyog by installing bio-gas plants in rural areas. The cattle dung and in some places human excreta also is digested in those house-hold or community gas plants and the methane gas produced during digestion is supplied to village homes for cooking purposes. In some villages street lighting is also being arranged. The digested sludge from the gas plant also forms an enriched soil-conditioner. The scheme is gaining popularity in the States of Maharashtra, Tamil Nadu and West Bengal. Already several thousands of bio-gas plants are installed in rural homes. Yet the scheme cannot reach the poorer sections of the rural population as the cost of an house-

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hold plant is not within the reach of the poor villagers. The Government of India has now initiated programmes for development of rural sector through Integrated Rural Development (IRD) programmes in selected districts in various States. The scheme aims at an all round improvement of irrigation, processing of agricultural products and by-products, developing public utility services like roads, buildings, supply of safe drinking water, safe disposal of human excreta and other public health measures. The impact of this programme is yet to be seen.

2.3.5 Water Pollution Control : In the post-Independence era awareness to the ensuing problem of water pollution due to rapid industrialisation was brought to focus by the All India Institute of Hygiene and Public Health, Calcutta, under the Ministry of Health. The Institute started carrying out pollution survey of some rivers in West Bengal, Bihar and Uttar Pradesh. Hooghly river pollution survey was first carried out by the Institute in the year 1950. Indian Council of Medical Research set up a research wing at the All India Institute of Hygiene and Public Health in 1954, for conducting pollution surveys and carry out research in the field of industrial waste treatment which worked for a period of twelve years (1956-68). This unit surveyed some major polluted rivers in West Bengal, Uttar Pradesh and Bihar and worked out feasible solutions to some important indus-

trial wastes like tannery, distillery, lac, sugar, paper and pulp, etc. The work initiated by the All India Institute of Hygiene and Public Health generated interest in many parts of the country and later many educational institutes and research organisations started working on this problem of water pollution. As a result of the active interest taken by the academic institutions, public interest in water pollution control was stimulated to some extent. Politicians also got interested in this problem. Finally a National Water Prevention and Control of Pollution Act was passed in the Parliament on 23rd March, 1974. Prior to this national act, pollution control act was in existence only in two States, viz., Maharashtra and Orissa. Consequent to this act to which 15 out of 22 States formed the signatories, water pollution control boards have been set up by now in all these States. Besides, a Central Board for Prevention and Control of Water Pollution was also set up in 1975, to coordinate the activities of the State Boards. The main polluters are industries and the local bodies who are discharging industrial effluents and the domestic sewage respectively into receiving waters without any treatment. It is roughly estimated that together they are discharging 35,000 - 40,000 million cubic metre of waste water into water and land environment in almost equal proportions.

Although boards are functioning for the past 2-4

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years, yet most of them are in a formative stage. Only Maharashtra, Provincial Water Pollution Board has made some headway. In the 5th five year plan a provision of Rs. 1.5 crores was made in the Central sector. Most of the State Boards, are now faced with the formidable obstacle of finance. Recently levy of a cess to meet the expenditure of Boards has been passed by the Parliament. Besides, most of the Boards are yet to equip themselves with adequate laboratory facilities and build up a technically sound infra-structure to carry out monitoring work. The total investment made on industrial development during the first four plans has been of the order of 2,30,000 million rupees, both in public and private sectors. Hardly 5% of the total industries have treatment plants worth the name to treat their effluents. The remedial cost for treatment at present day costs will be of the order of Rs. 1,300 crore of rupees is needed in the next two decades if we have to cover all urban towns with sewerage and sewage treatment facilities.

Hence, the provision for treatment facilities for these industries need to be done in stages, over a period less than two decades, if possible, so that it may be possible for the industries to find resources in the form of profits, loans and grants from Governments to cover the cost of necessary works. Mere legal enforcement may not bring out a change in the situation. Persuasive

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measures will have to be taken to ensure a step-by-step progress towards cleaning our water environment. Besides aids from international agencies, such as, U.N.E.P./ W.H.O. may have to be sought for supply of monitoring equipments, expertise and training of manpower. Some training programme has already been initiated by the Central Board. Central Board is also working out suitable guidelines for implementing the programme, effluent standards and water quality criteria. Research activity in the field of water pollution is being expanded to find out economic solutions to the problems of industrial waste treatment. A successful implementation of water pollution control, also depends on the public awareness, for which mass media like T.V., radio, etc. to educate the public should be utilised more effectively than before.

2.3.6 Air pollution control : In the wake of rapid industrialisation air pollution is also becoming increasingly important aspect of environmental pollution in this country. Principal growth industrially is envisaged in the fields of power, petro-chemicals, fertilisers, synthetic fibres like rayon, metallurgy, sulphuric and nitric acids, pharmaceutical industries, and various other chemical and ceramic industries. Gaseous emission from these are at present discharged into atmosphere without any

treatment. Only some industries have installed control equipments. But hardly 10% of these equipments are operating at the designed efficiency. Besides emissions from industries air pollution is also caused by domestic consumption of low grade fuels resulting in a smoky atmosphere, affecting visibility and causing smog. Auto exhaust is yet another major contributor to air pollution in our cities. Eighty percent of Indian automobiles are more than five years old and because of their age and improper maintenance they emit large quantities of carbon monoxide, hydro carbons, oxides of nitrogen, and other pollutants.

National Environmental Engineering Research Institute has been conducting air pollution surveys since last 5 years in major cities and towns of this country to determine the level of pollution. The survey reveals that concentration of important pollutants like particulates and $SO_2$ are already high in major cities of Calcutta, Bombay and Delhi and calls for immediate measures to abate and control pollution.

Existing laws, such as, Smoke Nuisance Act (1906) are not adequate to control air pollution and there is no legal provision as yet for the control of pollution. The National Committee on Air Pollution appointed by the Government of India in 1971 prepared a draft legislation which is now under consideration

of the Parliament and is referred to a Select Committee for review and recommendations. It is fervently hoped that the air pollution act will soon be passed by the Parliament and control measures will be initiated at an early date.

2.3.7 Solid waste management : The public health importance of proper collection and disposal of refuse and other wastes, is yet to be recognised by the urban dwellers as well as civic administration in the country. The practice of throwing the refuse generated in homes, and markets, restaurants and other public places, indiscriminately on the adjoining land or road is still the common sight in most of the cities and towns in India. Most of the towns have some sort of an organisation for collection, transportation and disposal of refuse, which is ill-managed, ill-equipped and also inefficient. Further, the financial stringency of the civic bodies is also the root cause for deterioration of this important civic service, as they are not able to cope up with the rapid growth of towns, and increase in population. The result of all these is the poor collection of refuse, inadequate and unsatisfactory transport facilities, and improper disposal thus filthy and insanitary conditions still prevailing in a greater degree in many towns and cities. Only a few cities like Bombay, Bangalore and Poona are

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comparatively cleaner although one can locate filthy spots even in these towns. The common disposal of refuse in most towns is dumping in low lying areas within or adjoining the towns. These dumping ground which were once located sufficiently away from the dwelling areas are now flanked around by dwelling units due to uncontrolled growth of towns in all directions, with the result that the inhabitant nearby are exposed to great risk of health hazards. Besides refuse, the night-soil collected from unsewered areas and unsewered towns is also disposed of in the same ground either by trenching or composting. Both these operations,as it is carried out now, are fraught with danger of spread of epidemics. The first ever survey to assess the existing condition and to characterize the refuse was conducted in Calcutta in 1970. Subsequently, surveys have been conducted in major cities and towns like Bombay, Ahmedabad, Nagpur, Bangalore, Madras and Calcutta Metropolitan District Areas. These surveys show a wide variation in the nature and characteristic of the urban waste. Quality and quantity widely vary. There is also some seasonal variation. Fermentable organic matters range from 50 to 75%. Inert materials vary from 15 to 30%. The calorific value is low of the order of 2000 - 2500 BTU. Average investment on solid waste management at present

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in Indian cities is as low as Rs. 5/= per head per annum. Lack of professional engineers, sanitarians, middle level management personnel and trained labour have also been a great constraint on this activity. Fragmentation of administrative responsibility for solid waste management frustrates the progress. On the basis of the data collected at different municipal centres it is estimated that output of urban wastes amounts to 0.3 to 0.5 kg of refuse, 0.2 kg of night-soil and 0.8 kg of urine per head per day. The manurial value of the huge quantity of refuse and night-soil alone available in Indian towns is immense. Table - 6 below gives the average manurial value of these two types of waste.

Table - 6 : Manurial value of urban wastes (refuse and night-soil) (based on urban population of 108.7 million).

| Class of refuse | Dry matter (tonnes) | Nitrogen (tonnes) | Phosphoric acid $P_2O_5$ (tonnes) | Potash $K_2O$ (tonnes) | Calcium CaO (tonnes) |
|---|---|---|---|---|---|
| Dry refuse | 10,117,752 | 75,880 | 45,530 | 131,525 | 556,450 |
| Night soil | 1,933,775 | 114,070 | 84,310 | 44,635 | 94,230 |
| Total | 12,101,027 | 189,950 | 129,840 | 176,160 | 650,680 |

From the above wastes it is estimated that over 10.8 million tons of good quality compost containing about 1% each of nitrogen, phosphoric acid and potash could be prepared annually, which has a monetary return of

Rs. 120 crores at the current rate of chemical fertilizers.

Realising this potentiality of 'wealth from waste' the Government of India in the Ministry of Agriculture launched a scheme for producing organic manure even before Independence era in the year 1945. Under the scheme, it was envisaged that all municipalities would practice composting and supply manure to local agriculturists. Legislation making it obligatory for the local bodies to subject refuse to the process of composting has been enacted in some States. Loan assistance, technical guidance are also being provided by the States. By 1974 as many as 3200 towns and cities have been covered by this scheme, producing about 4.8 million tonnes of compost per year.

The gap between present level of compost production (4.8 million tonnes) and the potential (10.8 million tonnes) indicates that there is scope to increase urban compost production in this country.

During the fifth five year plan, another programme to set up mechanical composting plants in 35 municipal towns and cities was launched by the joint efforts of Ministry of Agriculture and the Ministry of Works. According to this scheme, the municipality or corporation would receive a subsidy of 33% towards capital cost of the plant from the Ministry of Agriculture. The Ministry of Works and Housing will give financial assistance in the form of non-recurring grants ranging from 25 to 50% of their computed

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deficiencies in infrastructure requirements (purchase of transport vehicles and improvement of workshop facilities). A recurring grant to the extent of one lakh rupees per year will also be given to the same municipality as financial support for technical personnel in the integrated scheme. Already four mechanical compost plants of 150-200 ton capacity each has been set up at Ahmedabad, Baroda, Bangalore and Calcutta. Work on setting up other compost plants, one each at Madras, Lucknow and Kanpur is under progress. It is estimated that these plants together produce about one million tonnes of additional compost per annum at a production cost of about Rs. 60/= per ton which will be about 50% cheaper than the chemical fertilizer. During the fifth plan period a sum of rupees ten crores were provided under the national water supply and sanitation scheme for giving assistance for setting up mechanical compost plants.

2.3.8 Research & Training :

(a) Training : Prior to Independence, there was no training facility in India in the field of public health engineering. In fact, public health engineering was itself not considered as a speciality and the basic civil engineer was considered competent to carry out water supply and sanitation works. On the recommendations of the Bhore Committee, a post-graduate specialisation course

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in public health engineering was initiated for the first time in India in the year 1948, at the All India Institute of Hygiene and Public Health, Calcutta. At the same time a Certificate Course in Public Health Engineering was also started at the same institution to train the in-service subordinate engineers. With the launching of national water supply and sanitation programme in 1954, training of personnel engaged in the programme was considered as essential step and therefore besides the All India Institute of Hygiene and Public Health, three more centres for post-graduate trainimg, i.e. College of Engineering, Guindy, University of Roorkee and Victoria Jubilee Technical Institute, Bombay, were recognised for augmenting training programme. Under the national water supply and sanitation programme expenses towards fees etc. and stipends for the trainees were defrayed by the Centre to give incentive to the States to depute their in-service engineers to undergo training in public health engineering. With the setting up of seperate department of public health engineering/environmental engineering in almost all the States, and expansion of public health engineering activity, the demand for training of engineers in environmental engineering/public health engineering and other categories of personnel has increased year by year. To-day, there are thirteen institutions offering courses in public health engineering having a total input capacity of about 144 for

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graduates and 100 for diploma holders. Table - 7 gives the list of institutions, the training programme and the number of graduates trained in public health engineering to the end of 1977.

Please see Table - 7 (next page)

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## TABLE - V: INSTITUTIONS WHERE POST-GRADUATE TRAINING IS AVAILABLE IN INDIA.

| Sl. No. | Name of Institution. | Title of Degree. | Duration of course. | Qualification required for admission. | Maximum intake. | Course started in the year. | No. of graduates trained upto March, 1977. |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1. | All India Institute of Hygiene & Public Health, Calcutta. | M.E.(P.H.) | One academic yr. + one yr. practical training. | B.E.(Civil) or equivalent. | 30 | 1948 | 710 |
| 2. | *College of Engineering, Guindy. | M.Sc. (Engg.) | 2 years. | do | 10 | 1955 | 172 |
| 3. | Victoria Jubilee Technical Institute, Bombay. | M.E. (P.H.E.) | do | do | 15 | 1961 | 116 |
| 4. | University of Roorkee, Roorkee. | do | do | do | 10 | 1955 | 115 |
| 5. | Government Engineering College, Jabbalpur. | do | do | do | 10 | 1966 | 24 |
| 6. | Indian Institute of Technology, Kharagpur | M.Tech. (P.H.E.) | do | do | 8 | 1958 | 30 |
| 7. | M.S.University, Baroda. | M.E. (P.H.E.) | do | do | 8-10 | 1958 | 65 |
| 8. | Andhra University, College of Engineering, Waltair. | M.E.(P.H.) | do | do | 7 | 1963 | 32 |

continued.....

TABLE - 7 : INSTITUTIONS WHERE POST-GRADUATE TRAINING IS AVAILABLE IN INDIA.

(continuation)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 9. | Visweswariah Regional College of Engineering, Nagpur. | M.Tech (P.H.E.) | 2 years. | B.E.(Civil) or equivalent. | 10 | 1966 | 30 |
| 10. | University Visweswariah College of Engineering, Bangalore. | M.E.(Env. Engg.) | do | do | 8 | 1969 | 20 |
| 11. | Engineering College, Government of Kerala. | M.Sc. (Engg.) | do | do | 6 | 1971 | 8 |
| 12. | College of Engineering, Jadavpur. | M.E. (P.H.E.) | do | do | 10 | | 40 |
| 13. | Indian Institute of Technology, Kanpur. | | | | 10 | | 10 |
| | | | | | 144 | | 1372 |

*Also conducts training of Diploma holders at a rate of 2 batches per year with an intake of 30 per batch.

Table - 8 below gives the existing manpower in State Public Health Engineering Departments.

Table - 8 : Existing Manpower in Environmental Health

| | Number |
|---|---|
| Chief Engineers ... | 29 |
| Superintending Engineers... | 119 |
| Executive Engineers ... | 646 |
| Assistant Engineers ... | 2610 |
| Junior Engineers ... | 8967 |
| Add for States whose data is not available ... | 629 |
| Total ... | 13,000 |

Table - 9 below gives figures of trained and untrained manpower available in State Public Health Engineering Department.

Table - 9 : Statement of Trained Engineers in State Public Health Engineering Department

| | Total | Existing Man-power (Trained) with post graduate degree/ diploma | (Untrained) without post-graduate degree/ diploma |
|---|---|---|---|
| Grade Engineers | 7500 | 1000 | 6500 |
| Diploma Holders | 5500 | 1000 | 4500 |
| | 13,000 | 2000 | 11,000 |
| Percentage | | 15.4% | 84.6% |

Table - 9 shows that even after three decades the per-

centage of trained public health engineers manning the national programmes is only 15.4%. Hence the existing training facilities for engineers is too inadequate.

Training of auxiliary personnel was also started since the launching of national water supply and sanitation programme. The Central Public Health and Environmental Engineering Organisation is organising a number of orientation and refresher courses at different places. Table - 10 gives a list of these courses, venue and duration of each course.

Table - 10 : Refresher and Orientation Courses in Public Health Engineering

| Course Title | Venue | Duration |
|---|---|---|
| 1. Public Health Engineering Structures | Madras | 10 days |
| 2. Water treatment plant design | do | 5 days |
| 3. Corrosion control | do | 3 days |
| 4. Development in water and waste water treatment | Roorkee | 5 days |
| 5. Sewage treatment plant design | do | 7 days |
| 6. Water supply system management | do | 6 days |
| 7. Filter operator's course | Madras & other places | 7 days |
| 8. Waste stabilization pond practices | do | 5 days |
| 9. Refresher course for Chief Engineers and Senior Public Health Engineers | do | 4 days |

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| | | | |
|---|---|---|---|
| 10. | Distribution system analysis | do | 21 days |
| 11. | Waste recycling utilization for agriculture | do | 4 days |
| 12. | Sewage works supervisors' course | Nagpur | 1 month |
| 13. | Water & Sewage Analysts' course | Calcutta | 10 weeks |
| 14. | Rural Sanitation & Handpump Maintenance course | do | 2 weeks |
| 15. | Solid waste management | Nagpur | 1 week |

Besides, National Environmental Engineering Research Institute also conducts the following courses :

1. Preventive maintenance of water distribution system.
2. Air pollution control.
3. Solid waste disposal.
4. Environmental Microbiology.
5. Industrial waste treatment.
6. Sewage farming.
7. Chlorination & use of chlorinators.

Considering the magnitude of the works to be executed and plants to be maintained in future, and the expanded programmes that are likely to develop, the quantum of existing training facilities are too meagre to meet the increased demand for trained personnel that is going to come up in the near and distant future. Hence there is an urgent need for perspective planning for the manpower requirements.

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In order to bring out a uniformity in the training programmes that are carried out by different institutions, the Government of India in the Ministry of Works & Housing, set up a curricula committee in April 1974. The committee prepared a detailed curricula for all types of courses and submitted its report to the Government in 1976. The report was widely circulated to Universities, Public Health Engineering Departments and other educational institutions for adoption.

Government of India also prepared a manual for water supply in 1962 and the same has been revised in 1975. A manual for sewage and sewage treatment is under print and will be soon published.

(b) Research : Prior to Independence, research efforts to solve the problems in environmental sanitation was very much limited. Neither the State nor the Centre had any budgetary provisions to encourage research activity in the field of environmental health. The Indian Council of Medical Research was, perhaps, the only organisation which would provide grant-in-aid to educational and other institutions on approved projects which had a finite bearing on health. There was practically no research on applied technology in water supply and waste water disposal, either to modify imported technology so as to suit local conditions or to develop appropriate technology using indigenous resources. With the result even after the Indepen-

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dence, development continued to utilise the imported technology and know-how, which were expensive. Hence cost became a major constraint in developmental works, as the imported technology was highly expensive. Besides, there was no expertise developed in the country with the consequence cost of foreign expertise was expensive and was not within the reach of the country's economy.

In the post-Independence era, Indian Council of Medical Research took the lead to expand facilities for research, in the field of Environmental Health. The Council was the first to set up a Public Health Engineering Research Unit (PHERU) at the All India Institute of Hygiene and Public Health, in the year 1954. The unit carried out valuable research for a period of 12 years in the field of water pollution, rural water supply and rural sanitation. Meanwhile the Board of Scientific and Industrial Research and the Governing Body of the Council of Scientific and Industrial Research, on the recommendations of the Public Health Engineering Research Committee approved the establishment of a Central Institute under Council of Scientific and Industrial Research to undertake research and development activities in the country in September 1957. Hence, the Central Public Health Engineering Research Institute (renamed as National Environmental Engineering Research Institute) at Nagpur came into existence in the year 1958. The Institute has established nine zonal centres

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spread over the length and breadth of the country, and is actively engaged in applied research and developmental projects related to environmental health. Among the notable contributions of the Institute in developing indigenous technology are - (a) chlorine tablets and ampoules for disinfection, (b) Nalgonda technique for defluoridation, (c) development of cellulose acetate membrane indigenously to save foreign exchange, (d) development of a new culture media for MPF technique, magnitude iron oxide for concentration of virus, (e) surface aeration units, (f) millipore filter paper, etc.

Besides the National Institute with its large network of field centres, many other academic and research organisations are engaged in research and the tempo of research is gradually increasing although percentage expenditure on research on the basis of national income has remained, more or less, static. The big industries are also required under the present policy of the Government to set up research and development cells and to sponsor research activities out of their profits and some enterprising industrialists have set up research and development cells. A part of this expenditure also goesto research in environmental health to solve problems related to abatement of environmental pollution due to discharges of gaseous, liquid and solid wastes from industries. As already described in a preceding paragraph, some very valuable

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contributions are made by educational and research institutions like All India Institute of Hygiene and Public Health, in the field of rural water supply and sanitation research. In rural water supply by means of tubewells and handpumps, the Institute of Hygiene has by its long experience in Singur, have developed a suitable organisation pattern for sinking, and resinking of tubewells and maintenance of handpumps, has solved the problem of chokage of metallic strainers by use of hand-made non-metallic strainers using indigenous materials like hollow bamboo and coconut coir, a new design for handpumps to reduce maintenance cost and prolong life, satisfactory design for latrine pans and plates, a cheap superstructure and lining, an iron elimination unit for tubewells, etc.

Council of Scientific and Industrial Research sponsors research in other academic institutions in the field. A number of research followships are also offered by Council of Scientific and Industrial Research, Indian Council of Medical Research, University Grants Commission to young and bright scientists who would like to pursue knowledge and take up research as a career. A number of researches are also undertaken by the collaboration with International agencies like W.H.O., U.N.D.P., U.S.A.I.D., World Bank, etc. at different institutions. National Environmental Engineering Research Institute carries out many such projects. Department of Science and Technology

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has established an Environmental Science Division. This Division collaborates with world bodies, such as, U.N.E.P., U.N.D.P. in the matter of world environmental protection. Department of Science and Technology also offers assistance to scientific bodies in the country to carry out research and investigation in all aspects of environmental protection.

2.3.9 Allocations and outlays : Budgetary allocations and financial outlays on water supply and sanitation schemes during the past five year plan periods under the National Water Supply and Sanitation Programme is shown in Table - 11. The programme included, water supply (urban and rural), urban sewerage and sewage treatment, public health engineering training programme, water pollution control programme+, solid waste disposal programme+, conversion of dry latrines to water borne latrines in urban area+, urban development (Calcutta) schemes. The Table shows that the investment made upto end of 1977 in urban and rural sectors towards water supply and sanitation was of the order of Rs. 1,062 crores and Rs. 747 crores respectively.

+Central sector schemes.

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## TABLE-11: PROGRESS ON WATER SUPPLY & SANITATION SCHEMES DURING FIVE PLAN PERIODS (1951 - 1978)

| Category of scheme. | Plan period. | URBAN | | | RURAL | | |
|---|---|---|---|---|---|---|---|
| | | No. of schemes sanctioned. | Estimated cost in crores. | Actual outlay during the period Rs. crores. | No. of schemes sanctioned wells sunk/ renovated. | Estimated cost (crores) | Actual outlay Rs. in crores. |
| A. National Water Supply & Sanitation Scheme. | 1st 5 yr. Plan (1951-56) | 252 | 45 | 10 | 133* | 13.5 | 6 |
| | 2nd 5 yr. Plan (1956-61) | 208 | 27.9 | 42 | 214* | 5.48 | 18 |
| | 3rd 5 yr. Plan (1961-66) | 529 | 89 | 135 | 1764* | 16 | 27 |
| | (1966-69) | 150 | 39 | | 478* | 21 | |
| | 4th 5ryr. Plan (1969-74) | - | 261 | 261 | * | 131 | 131+ |
| | 5th 5 yr. Plan (1974-78) | | 439.35 | | N.N.P. | 573 | |
| B. Community Development Programme. | | | | | No. of wells sunk or renovated | | |
| | 1st 5 yr. Plan | - | - | - | 1,07,000 | - | 4.5 |
| | 2nd 5 yr. Plan | - | - | - | 4,53,000 | - | 11.5 |
| | 3rd 5 yr. Plan | - | - | - | 6,40,000 | - | 13.0 |
| | 4th 5 yr. Plan | - | - | - | Fig. not available | | Fig. not available |
| C. Local Developmental Works. | 1st 5 yr. Plan | - | - | - | 29,650 | - | 7.25 |
| | 2nd 5 yr. Plan | - | - | - | 1,02,050 | - | 13.00 |
| | 3rd 5 yr. Plan | - | - | | - | - | 35.00 |
| | 4th 5 yr. Plan | - | - | | Figures not available | | |
| D. Welfare of Backward Classes. | 1st 5 yr. Plan | - | - | - | - | - | 3.00 |
| | 2nd 5 yr. Plan | - | - | - | 20,000 | - | 3.00 |
| | 3rd 5 yr. Plan | - | - | - | - | - | 4.00 |
| | 4th 5 yr. Plan | Figures not available | | | | | |

*Piped water supply schemes covering group of villages and villages in the scarcity and endemic areas are covered by this scheme. It is roughly estimated about 64,000 villages will have been covered by the end of 5th five year plan by this scheme.
Central sector schemes : P.H.E. training, water pollution control, solid waste disposal and conversion of dry latrines. (Estimated cost in crores =,16.50).

Allocation for urban development (Calcutta) = 250.00 (estimated cost in crores)

2.3.10 Housing : The urban population in increasing by about 4 million persons per year, necessitating the construction of one million dwelling units annually. According to survey conducted by the National Building Organisation on the basis of 1971 census, there was a shortage of 15.6 million houses in the country of which 11.8 million in rural areas and 3.8 million in urban areas. Estimated rate of houses constructed in India is about 2 dwelling houses for 1000 population per year as against 10 per 1000 population per year recommended by United Nations Organisation. Even to clear up the back log in urban areas, it calls for an investment of the magnitude of four thousand crores of rupees. The Government of India in the Ministry of Works and Housing have set up a National Building Organisation to coordinate the activities of urban and rural housing in the country. A country and town planning cell is also functioning in the same ministry to coordinate activities in planning for new townships, rural housing schemes, etc. A Housing and Urban Development Corporation (HUDCO) is also set up for raising funds, and distribution of loans and subsidies to several State Housing Boards, State Apex Housing Corporations, etc. There are well over 22,000 housing cooperatives in the country with a membership of more than 30 lakhs. These cooperatives together have constructed more than 5 lakh housing units and nearly an equal number of

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units were under construction in 1974. Apex Cooperatives have been formed in 16 States including Union Territories to provide finances to primary societies. Throughout the country cooperative housing movement has been the movement of people of all walks of life, viz., economically weaker sections (EWS), Lower income group (LIG) and lower middle income group (MIG). The majority of the population of the country falls under EWS and LIG income groups and they face acute housing problem for obvious reasons. The Ministry of Works and Housing have introduced eight social housing schemes for these people since 1952. Out of these eight social housing schemes, except the scheme for housing the plantation workers, all the schemes are under the State sector. At present thecooperative housing movement is suffering from acute shortage of funds. The Life Insurance Corporation is the only source of finance by the Apex Cooperatives.

As regards rural housing approximately 32,42,406 (of which 29 lakhs undeveloped) housing sites have been allotted to landless workers. Now these people need to be helped to construct houses. Some States like West Bengal are providing some small financial assistance. But the assistance is too meagre for the purpose.

Since the recognition of the necessity for public housing and introduction of a number of 4584 million rupees have been sanctioned, resulting in the construction of

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about 6,64,000 dwelling units. Life Unsurance Corporation has made the largest investment in housing and by the end of 1975-76, 6566.5 million rupees has been advanced by the Life Insurance Corporation. The fifth plan outlay provided for 5105.60 million and the anticipated expenditure during 1974-77 was of the order of 2604.90 million.

Under the Council of Scientific and Industrial Research, a Building Research Institute, has been set up at Roorkee. The Institute has initiated a number of research projects to bring down the cost of construction by replacing conventional building materials by non-conventional ones. Use of cintered fly ash in cement concrete, light weight aggregates in the manufacture of prefabricated elements, stabilized soils in place of burnt bricks, are some of the notable contributions of the Institute in bringing down cost of construction. A pre-fabricated housing factory is also set up near Delhi for manufacturing pre-fabricated housing elements at a cheaper cost. But use of such non-conventional materials and prefabricated components is yet not been popular and people's choice continues to be traditional methods of house construction.

All efforts to improve the housing situation put together, has not even touched the fringe of the problem. The solution to the problem lies in integrated development of rural areas, decentralization of industries, development of satellite towns, neighbour-hood units, etc.

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2.3.11 Slum clearance versus slum improvement schemes : In major cities like Delhi, Bombay, Calcutta and Madras slum clearance and slum improvement schemes have been executed during the last 3 decades. Slum clearancebeing more complicated, slum improvement was accepted as an interim measure and preferance is now given to slum improvement, as available resources are also limited. In Calcutta, Calcutta Metropolitan Development Authority has been executing a number of slum improvement schemes with the assistance from World Bank. In Delhi, 24 settlement schemes for slum dwellers was completed in a remarkably short period of one year. Since over 30% of the population in those cities live in slums or pavements and the programme envisages improvements of some physical environmental conditions only, it has not made much impact, because the problems of slum dwellers is not merely physical but more of a socio-economic nature and requires an overall uplift of the slum dwellers.

2.4 Cultural and causal milieu as constraints :

In the preceeding paragraphs an outline of the progress that has been made in different aspects of environmental health has been presented. In terms of financial outlay on these improvements, the investiment made so far works out to a meagre sum of Rs. 60 crores per year during the past 3 decades. Hence, one would logically conclude that the main constraint for achieving better progress is

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finance and if adequate resources are found it is possible to reach theset target. But this is not quite true. No doubt, more resources need to be mobilised to accelerate the progress, if we have to reach any set goals. But, there are many other factors, which are also contributory to the success of environmental health programmes. One such factor identified by the Health Survey and Development Committee, which even today is relevant, is the lack of sense of responsibility by the individual towards his community. This is evident by the way an individual disposes of the wastes he generates in his house-hold. Although in rural villages one can justify this to the lack of general and health education, in urban towns, this is mainly due to lack of appreciation of his responsibility to the community.

The second factor, which acts as a constraint is the different cultural patterns that exist in this vast country. Classical example is a community latrine, which is accepted is one group because, it is in tune with their cultural pattern, whereas it is not acceptable to another group as it is not in line with their way of life.

A third factor is the habit, taboos and beliefs. This is a major factor in the success of rural latrine programme. Women folks in some rural areas are habituated to go in groups to field in the early morning, sit around shrubs to defecate and utilize this opportunity to discuss

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about their family affairs. Hence, an attempt to break this by providing individual house-hold latrines will meet with resistance and the social scientists have a big role to play in changing the habits and beliefs of the people.

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# CHAPTER III

## 3. Discussion of issues and forecasts for future

### 3.1 Relevance :

At this stage when three decades have passed, since Independence and national policy and plans have been implemented in the successive 5 year plan periods, it is necessary to consider how far the actions taken, was relevant to the situation. Such an evaluation step will enable us to correct wrong steps if any, taken in the past and to proceed on the right path in future to reach the set goals.

### 3.2 Priorities :

That health is a basic necessity for economic development of a nation is an established fact even before the first launching of national planning and development in this country. Why then the experts involved in national planning did not give due priority for health programmes in the national plan right from the beginning. Even among the health measure, environmental health did not receive its due recognition during the earlier plan periods. It is only since the beginning of third plan, water supply and sanitation were given equal importance as other health measures. Again, in the national water supply and sanitation programme, rural sanitation has been completely neglected in all the five plans. Similarly urban liquid and solid waste disposal have also received scanty attention. In allocating priority among environmental sani-

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tation measures it is true that water supply takes the first place. But it is also a known fact that water supply alone cannot wipe out the water-borne and filth-borne diseases. Unless water supply as well as waste water disposal are taken care of simultaneously the health status of the community will not change appreciably. This has been amply demonstrated by many studies including recent World Health Organization study conducted in Philippines.

3.3 Utilization :

A glance at the Table of allocations and outlays on water supply and sanitation during the five plan periods, indicates that, there has not been a 100% utilization of allocations in any of the plan periods although percentage utilization has been steadily increasing from plan to plan. The reasons for this has been explained by the reviewing committees from time to time. In the earlier plans, investigations and detailed projects were not ready and also there was no seperate public health engineering organisation in all the States with adequate trained personnel. Hence, considerable time was lost in carrying out the preliminaries and setting up of teams to execute the projects. Secondly, there was no comprehensive planning for either of the services, namely, water supply and sanitation. Budgetory sanctions were made on a year to year basis so much so that the States were unable to foresee the quantum of loan or grants in the ensuing years and could not plan

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the projects well in advance. There was also shortage of some proprietory materials and equipments, such as, pipes and large size pumps, etc., which had to be imported in the earlier plan periods. Last but not the least important was the response from the communities who were to receive the benefit was also not very spontaneous. So much so that there was a lag period involved in arousing the interest of the local bodies to utilize the concessions available under the national scheme and the people to be convinced that it is their felt need to provide water supply and sanitation to their community. But the response has been gradually changing. There is also another reason for the local bodies, to have not been able to fully utilize the opportunity of loans and grants because public financing institutions like Life Insurance Corporation, nationalised banks in the initial stages of the plan periods, were not geared up for advancing loans for such schemes. There was lot of procedural delays in sanctioning loans to local bodies to raise matching grants and the local bodies had to provide sufficient data to show the viability of the scheme.

3.4 Alternative mechanisms :

When the water supply and environmental sanitation schemes were launched towards the later part of first five year plan there was only a single mechaism by which the entire operation had to be carried out, i.e. the Government

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organisation. When the progress started slackening due to slow motions of Government machinery and allocations were meagre, alternative mechanisms have been considered after passing through the first and second plan periods. One of the earliest recommendations was made by the T.C.M. team, who suggested, at least, five alternatives for better financing and management of the programme. These are -

(1) Formation of independent Regional Water and Sewage Boards organised to operate as utility business and removed from the fluctuating vagaries of political change. Would attract the voluntary participation of the public in water and sewerage financing schemes.

(2) Imposition of a compulsory loan on the properties to be served by the improvements in the form of a proportion of the annual rental value of the properties. The sums so borrowed would be repaid over a period of years by water supplied at established rates.

(3) Levy of a special purpose tax or cess against properties, a method more useful for operation and maintenance rather than for raising capital funds.

(4) Setting up of a revolving fund with the payments of annual principal and interest received by Centre together with yearly allotment of new loans to build up a progressively larger revolving fund for construction. Such an arrangement would be especially advantageous if international grants-in-aid specially earmarked for water supply

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and sanitation become available for self liquidating projects.

(5) Financing by lotteries and prize bonds.

None of these suggestions have yet been adopted except that Statutory Water and Sewage Boards have been set up in some larger cities and towns. Even these boards are not functioning independently as envisaged by T.C.M. team and are yet to prove their financial viability. Since they are being backed by State or Central Government they are in a position to obtain loans from public financing institutions, such as, Life Insurance Corporation, nationalised banks and the international agencies like World Bank, etc. How far they will be in a position to repay the loan commitments is yet to be seen. Except for half a dozen boards that have started recently functioning, the entire programme is still being carried out by the same Government machinery, which is 'expenditure oriented' rather than 'production oriented'. Public involvement in any of the programmes is still conpicuously absent, although much has been talked off on many platforms.

3.5 Buillding up capabilities :

There has been a considerable progress in building up capabilities in terms of both men, and materials. Yet the built in capabilities are or will be much in short of requirements if the programme has to take off at an accelerated speed in future. As regards expertise and technical know-how, there is adequate potential in the country and

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there is no need to import expertise and technology. But there is a great need to develop indigenous or appropriate technology particularly in the rural sector to meet the socio-economic needs and the aspiration of the rural people. High level technical training programmes are adequate but need augmentation in quantity trained. Middle-level and low-level training programmes need practical and field orientation and also need augmentation in numbers.

The country is able to produce adequate quantities of pipes and auxiliaries needed for water supply and sanitation required in future. But it is still deficit in production of electrical and electronic gadget needed for operation and control of plants. Similarly, many of the waste water treatment equipments are still being imported. These have to be produced indigenously if we have to accelerate the programme for sewerage and sewage treatment. There has been a phenomenal growth in production of analytical tools. But yet, some very sophisticated analytical instruments are not yet produced in the country. These will be needed in the coming years when water pollution and air pollution control programmes are more effectively implemented.

3.6 Implementation process :

In the present implementation process, there is still diverse agencies administering the programme and different engineering departments were employed on the

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actual field implementation. Such a multiplicity of agencies both on the administrative and engineering side is hardly conducive to effective results. Planning and implementation is done from top to bottom, while it is most desirable that it should proceed from bottom to top. Planning should be done at district level. District level and block level elected bodies be involved both in the process of planning and implementation. They may even be able to implement the projects with proper guidance from the technical departments.

3.7 Projections for the future :

3.7.1 Population forecast : The basic data required for comprehensive planning for the next two decades (upto 2000 A.D.) is the projected population by 2000 A.D. Demographers have predicted that India's population will reach a figure of roughly 941 million by 2000 A.D. of which 205 million will be urban and 736 million rural (21.2% urban and 78.2% rural) as shown in Table - 12.

Table - 12 : Forecast for future population.

| Decade | million | | |
|---|---|---|---|
| | Urban | Rural | Total |
| 1971 | 108.88 | 438.25 | 547.13 |
| 1981 | 148.11 | 523.90 | 672.01 |
| 1991 | 194.39 | 604.57 | 798.96 |
| 2000 | 205.00 | 736.00 | 941.00 |

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In the Chapter on progress on water supply and sanitation during the past 3 decades, coverage has been measured under different items of programmes in terms of percentage population based on 1971 census figures. For example, under Table - 1, page coverage of urban water supply by population is 80% of 1971 census figures, which means, roughly 870 lakh or 87 million. The balance population (urban) to be covered by the turn of the century will be roughly 118 million. Similarly the balance rural population to be covered by 2000 A.D. will be about 690 million. Urban sewerage covered so far is 37 million and balance sewerage to be covered for the projected population is 168 million. The number of house-holds in urban towns will increase from 40 million to 67 million. The number of house-holds with service-latrines and those having no latrines in urban towns will either remain stationary at 14 million or increase marginally to 18 million. The number of urban towns will increase approximately from 3119 (as per 1971 census) to 4200. The number of villageswill increase from 5,75,855 to about 6,00,000. Number of problem villages will increase from 1,53,000 to 2,60,000 covering a population of about 220 million. By and large, the rural sanitation will have to cover the entire rural population of 736 million.

3.7.2 Urban water supply : Water use in 2000 A.D. is estimated by different authorities and the most

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acceptable one is presented in Table - 13.

Table - 13 : Water use in India 2000 A.D.

| Use | in 1000 million Cu.M. Abstracted from source. | Consumed. | Discharged after use. |
|---|---|---|---|
| Irrigation & live-stock | 869 | 783 | 86 |
| Power | 150 | 5 | 145 |
| Industry | 35 | 10 | 25 |
| Domestic | 38 | 8 | 30 |
| Total | 1092 | 806 | 286 |

Source : K.L.Rao. "India's Water Welath". Orient Longman, page 218.

A look at the Table indicates that the thermal pollution by power plants will be the highest and waste water carrying chemical fertilizers and pesticides will be the next highest pollutants. The waste water from industries and the domestic waters are almost equal in volume and cause some degree of pollution if discharged without any treatment.

Table - 14 : Water Requirement by 2000 A.D.

| Community | Population in millions | Water million cubic meter/day |
|---|---|---|
| Urban | 205 | 41* |
| Rural | 736 | 55* |
| Total | 941 | 96* |

*Based on a per capita supply of 200 Lpcd in urban areas and 75 litres/day in rural areas.

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As per the data collected from States, a supply of 9.87 million cubic meter of per day is being supplied to a population of 90.43 million at present. It may thus be seen, that while the optimum requirement of drinking water for the urban population by 2000 A.D. is 41 million Cu. M. a day, the quantity that is being supplied now is only 9.87 million Cu. M. a day. The gap is 31.13 million Cu. metre a day and is very wide and the population to be covered will be 118 million. Assuming a per capita cost at the market rates prevailing in mid-decade (1991) of Rs. 300/=, the cost of providing water supply to all the urban population by 2000 A.D. will be Rs. 34,500 million or 3450 crores of rupees.

Beside this the existing water supply need reorganisation and augmentation and the cost involved at a rate of Rs. 150/= per capita for 90 million population will be Rs. 13,500 million or Rs. 1,350 crores. It may thus be seen that the overall cost of implementing water supply schemes to cover the entire unserved urban population and for augmenting the existing supplies to the needy areas in the urban area alone would require 4,800 crores of rupees which amount to providing an annual fund of Rs. 240 crores per annum for the next two decades (1980 - 2000). Besides, it is necessary that serious though be given to find a solution to the problem of maintenance as otherwise, the vast number of projects that is

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likely to be executed during the International Drinking Water Supply and Sanitation decade and further (1981 - 1990 and onwards) may go by default in the same manner as the existing ones.

3.7.3 Rural water supply : It will be a futile exercise to forecast the cost involved in providing water supply to balance rural population of 690 million by 2000 A.D. in the absence of a detailed assessment of the magnitude of the problem. Only this year under the accelerated rural water supply scheme, States have been asked to set up seperate Investigation Division to carry out detailed surveys. The per capita cost of rural water supply also varies widely (Rs. 250 - 80) depending upon the availability and vicinity of the source, type of water supply, etc. Even assuming an average per capita cost of Rs. 150/= the cost involved to provide water supply to all the rural villages will be of the order of Rs. 10,300 crores. An annual outlay of Rs. 500 crores will be required to cover all the villages by 2000 A.D. It may not be very difficult to find this amount by pooling resources and also by securing assistance from international agencies like I.D.A., U.N.I.C.E.F., DANISH, JOINT HEALTH CARE PROGRAMME of W.H.O. and U.N.I.C.E.F., etc. But what is more important is the lack of a suitable infra-structure and a machinery to execute and maintain these facilities. Secondly, material and man-power requirements may also

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become a constraint to complete the works in the stipulated period.

The present thinking of Government of India, on the strategy for future action with reference to rural water supply is to cover all the balance problem villages whose number has swelled upto 2,01,006 as per the latest assessment by the States (excluding 57,929 villages already covered by the previous plans) by 1985, by the two programmes, viz., accelerated rural water supply programme under the Central sector and the minimum needs programme under the State sector. The financial outlay involved is estimated to cost Rs. 1,900 crores to be spread over a period from 1978-85, which means an annual outlay of about Rs. 200 crores. If this could be achieved and a tempo is built up for accelerated rural water supply by 1985, it may not be very unrealistic to expect that the goal of providing drinking water facilities to all villages by 2000 A.D. would be reached. But, there is no thinking as yet, about the disposal of waste water and human excreta, at least, in the villages where water supply is already existing or is likely to be provided in the coming years.

3.7.4 Urban sewerage : One estimate for providing only domestic sewerage and treatment systems to cover 205 million population by 2000 A.D. puts the cost of balance works at 1,300 crores of rupees. Besides, cost of collection and treatment of industrial waste water will cost

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another 800 crores of rupees. There is no perspective planning for these two facilities so far.

3.7.5 Solid wastes in urban areas : With the increase in urban centres and urban population by 2000 A.D. the problem of solid waste collection and disposal will become more acute. The existing infra-structure in many towns have to be improved. Transport facilities have to be augmented. Methods of disposal have to be improved and augmented. Besides better management techniques have to be applied.

Above all, civic consciousness and public interest in keeping the city and its environ clean has to be aroused by mass media approach. Average investment on solid waste management at present in Indian cities is as low as Rs. 5/= per head per annum.

By 2001 A.D. estimated urban population is expected to reach 205 million. Hence, measures are needed both to augment the facilities for solid waste collection and disposal to the existing population (1971) as well as to provide additional facilities to cover the increase in population by 2001 A.D. Improving existing conditions to cover the present population of 109 million, requires improving collection, transportation and disposal systems. This may roughly be estimated to cost an additional expenditure of Rs. 10/= per capita per annum and a total additional expenditure of 1,090 million rupees per annum has

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to be found. To cover the increased population of 96 million, by 2001 A.D., based on a per capita expenditure of Rs. 20 per annum another 1,920 million rupees per annum has to be found. In all an additional investment of about Rs. 3,000 million or 300 crores of rupees per annum will be required for proper collection and disposal of solid wastes by 2001 A.D. How far the local bodies with their already deficit financing will be able to meet the situation is a moot question for which answer could be found only by a drastic change in the policy of financing and management of municipal services in general and solid waste management in particular.

3.7.6 Waste disposal in rural areas : Waste disposal in rural areas has received little or no attention so far. It is roughly estimated that hardly 2% of the rural population are provided with sanitary latrines for rural homes. Besides human excreta, the present practice of disposal of animal excreta, animal urine, cattle house sweepings, etc. are also not satisfactory and leading to unclean home surroundings, wastage of available nutrients, fly nuisance, etc. Another problem arising out of providing adequate water supply by means of a piped water supply system, is the disposal of waste water. If this sullage water is not properly collected and disposed off, it leads to stagnant pools, breeding of mosquitoes and causing spread of malaria and filariasis.

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Hence, both rural water supply and rural waste disposal should be considered simultaneously and an integrated approach to tackle them together should be adopted. Whenever practicable an ecologically balanced integrated system for water supply and waste disposal should be adopted to recover energy and nutrient from the waste products. Details of such a system is discussed in the Chapter on "Recommendations". Since almost a beginning has to be made in the planning, programming and implementation for rural sanitation, it has to cover the entire projected population of 736 million by 2000 A.D. which may not be feasible from both resources and managerial point of view. However, a beginning has to be made and certain set goals should be reached by the turn of the century.

3.7.7. Water pollution control : Referring to Table - 13 on page 82 estimated water used by 2000 A.D. by industries will be approximately 35 thousand million cubic metre and that by house-holds 38 thousand millions. Together they may be expected to put out a waste water to the extent of 55 thousand million cubic meter, which when uncontrolled may cause serious water pollution problems of all major and minor water resources in the country. Hence, it is essential that a sound water resources management policy should be developed in the immediate future leading to conservation of water and

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recycling of waste waters for better economy and prevention of pollution. Inter-State Water Resources Management Boards should be set up for all major river water basins in addition to the State Water Pollution Control Boards. The two should work in close collaboration for best utilisation of water resources and effective prevention and control of water pollution. The Central Board should act as a liasion between the Inter-State Board and the State Boards.

3.7.8 Training : A recent stock-taking of existing man-power in several State Public Health Engineering Department is presented in Table on page The Table shows about 6500 graduate engineers and 4500 diploma holders constituting about 84.6% of the existing staff (1977) are yet to receive training in Environmental Health. Total input capacity of all the institutions offering post-graduate and under-graduate training is only 150 for graduates and 100 for diploma holders (vide Table on page ). Hence, the back log can never be cleared even in the next two decades, unless measures are taken to augment the training facilities. Besides, there is need to introduce new training programmes, such as, in the field of solid waste management, water conservation and resources management, air quality management, etc.

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as activities in these areas could be expected to increase during the next two decades. In the absence of data collected by systematic manpower surveys, a rough forecast for the manpower requirements in environmental health for the next two decades (upto 2001 A.D.) is presented in Table 15 below.

Table 15 : Forecast for Manpower Requirements in Environmental Health by 2000 A.D.

| Activity | | Category | Existing strength | | Projected additional future requirement (trained) for next 2 decades (2001 A.D.) |
|---|---|---|---|---|---|
| Main | Sub | | Trained | Un-trained | |
| 1. Human settlement. | Water supply & sewerage & treatment. | a) Env. Engrs. | 1000 | 6500 | 2000 |
| | | b) Subordinate Engineers | 1000 | 4500 | 6000 |
| | | c) Sanitarians | N.K. | N.K. | 2,00,000* |
| | Solid Waste Management. | a) Management personnel | | | 190 |
| | | b) Env. Engrs. | | | 1090 |
| | | c) Technicians | | | 7450 |
| 2. Industrial waste and Water Pollution Control | Industrial treatment & Consultancy services. | a) Env. Engrs. | N.K. | N.K. | 2400 |
| | | b) Research Scientists | N.K. | N.K. | 1200 |
| | | c) Laboratory Scientists | N.K. | N.K. | 1200 |
| | Water Pollution Control | a) Env. Engrs. | 20 | 60 | 300 |
| | | b) Sanitary Chemists/ Microbiologists | N.K. | N.K. | 200 |
| | | c) Laboratory Technicians | N.K. | N.K. | 800 |

N.K. = Not known

*Based on the assumption that additional task force of Sanitarians will be set up exclusively to deal with rural sanitation in the promotion of latrines, integrated waste disposal systems, etc. as recommended in Chapter IV.

| | | | | |
|---|---|---|---|---|
| 3. Environmental Control | a) Env. Engrs. | N.K. | N.K. | 500 |
| | b) Environmental Scientists | N.K. | N.K. | 500 |
| | c) Supporting scientific & engineering staff. | N.K. | N.K. | 1000 |

N.K. = Not known.

Calculations are based on the assumption that by the turn of the century, water supply and sewerage facilities will be extended to all urban population and drinking water will be made available to entire rural population. Besides, treatment facility will be provided to a large volume of industrial waste waters to abate water pollution and solid waste management will be improved and augmented to a satisfactory level. Rural sanitation will receive due attention and a strategy will be worked out for a planned programme to cover the rural population with sanitation facilities as suggested in the Chapter on Recommendations.

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# CHAPTER IV

## Recommendations

A review of the progress on several aspects of environmental health for the past three decades as presented in the preceding chapter, clearly indicates that, so far the emphasis was mainly on water supply and that too in the urban phase where some tangible progress could be claimed. Other aspects of environmental health, both in urban and rural sectors, have received scanty or very little attention so far. Further, in all the endeavours to improve environmental conditions, there has never been a comprehensive planning and a decision to implement the total programme within a specified period, which will give a proper indication of the future magnitude of the problem and the quantum of requirements for such a programme. Secondly, environmental health did not receive a high priority in the earlier plan periods. Perhaps, it was also not possible to do so, in view of the overriding priorities then prevailing for such developments, such as, agriculture, basic industries, etc.

(1) Hence as a first step in developing a comprehensive plan for environmental health, it is recommended that from the sixth plan period onwards, environmental health should receive a very high priority in the planning and development process as otherwise the health and

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economic development of the country alike will inevitably suffer.

(2) As far as practicable and funds permit, a comprehensive planning for improvement of all important environmental conditions in a particular area, town or village, should be adopted so that, it really brings about the desired results in terms of elimination of diseases, savings in medical bills, increased production and improved economy. The improvement so brought about should satisfy the minimum standards both qualitatively and quantitatively. Such a comprehensive development will be more economical than piecemeal development.

(3) Independent statutory bodies styled as "Water and Sanitation Boards", either State-wise or on a region-wise basis, be set up in all the remaining States, vested with adequate statutory powers to promote and finance water supply and sewerage schemes for all urban local bodies. These statutory boards should exercise control on investigation, design and construction and operation of the projects on behalf of the local bodies in the same manner in which commercial enterprises are managed by business houses. The concept of water as a merchandise are not free but to be paid for, has to be popularised among urban dwellers. Elected peoples representatives should be actively involved at all stages of planning and implemn tation of projects.

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(4) When these boards are set up, prospects of securing international and bilateral aids or loans for the development of water supply and sewerage systems as a joint utility venture should be explored for all bigger schemes.

(5) Considering International Water Supply and Sanitation Decade (1981-1990) as the period for short-term development and the two year period ahead (1979, 1980) as the preparatory time, all the remaining towns and cities (numbering 1029 as on March 1978) should be provided with protected water supply system during the sanitation decades. Besides, the existing water supply system in all the 2092 towns, should be improved and augmented to meet the standards, both quantitatively and qualitatively.

As per the current practice, the urban citizen is kept unware of the water supply and sewerage schemes, upto the time when he is asked to take house connections. It is, therefore, necessary that all citizens be kept well informed of the project right from the stage of planning to the stage of completion, so that he is prepared to cooperate readily for completion and utilization of both the utility services. It may even be better if the elected representatives be involved in the basic planning, policy framing, motivational aspects and fixing of priorities. Similarly, in the maintenance phase, Mohalla

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Vikash Samities be formed to look after the services in their areas. It is observed whenever such samities and voluntary forces are vigilant and effective the maintenance staff also discharge their duties better. A natural outcome of formation of such samities will be that when a large group of people will involve themselves into such activities the average person in the area will refrain from making sanitary conditions bad in his own area.

It is also worth-while an experiment to put the municipal cleansing staff of an area, directly under a "Mohalla Safai Samiti" which shall need to be vested with more powers. This applies to all municipal utility services including refuse collection and disposal, public latrines and urinals, etc. The present slum improvement schemes in major cities be completed as a <u>short term interim</u> measure during the next plan period. But slum clearance projets should also be planned along side. The action taken by the Delhi Development Authority to rehabilitate the slum dwellers in 24 new colonies is noteworthy. Similar projects be implemented in all major cities. Carefully selected areas could be developed and plots allotted to slum dwellers and allowed to construct their own houses as per standard designs and with the assistance of loan facilities from nationalised banks or international banks and aids.

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(6) Considering the cost involved in providing sewerage and sewage treatment for all the towns, provision of sewerage system and treatment works should be taken up as a long term measure spread over a period of 25-30 years. Meanwhile, as an interim measure, during the sanitation decade, conversion of dry latrines to sanitary water seal latrines should be taken up side by side as a practical solution to the problem of insanitary conditions and the need for 'Bhangi Mukti' (emancipation of sweeper class) at the earliest possible time. A strategy should be worked out to convert all the service latrines in 7 million house-holds into sanitary latrines and provide sanitary latrines to the other 7 million house-holds, who have no latrines in the urban areas. Priority should be given to the unsewered areas of the sewered towns.

(7) As an integrated approach, all towns where protected water supply is yet to be developed, sewerage schemes should also be provided simultaneously.

(8) In municipal towns not governed by the proposed Water and Sewage Board, local bodies should revise the existing bye-laws to levy water and sewer service charges (both towards capital development and maintenance) so as to make the water supply and sewerage schemes self-supporting. State Governments should initiate action in formulating rules and procedures for each category of

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urban towns.

(9) The existing infrastructure of municipal administration need a thorough overhauling so as to provide adequate technical and administrative staff to supervise and maintain water supply and sewerage systems in sound and efficient manner. There is always an acute shortage of trained technical manpower in municipal towns. The pay structure and promotional avenues should be improved to attract well trained personnel to work with satisfaction. Integration of municipal engineering services with the State Public Health Engineering services is one such measure in the right direction to improve prospects of promotion.

(10) Most of the medium size towns are having a storm cum sullage drainage system. An account of poor maintenance of this sullage drains, they have bome stagnant pools leading smell nuisance and mosquito menace. As a short term measure sullage drainage should be improved and the sullage water drained into convenient points and pumped and treated in oxidation ponds located at suitable elevations so that the treated effluent can be utilized for irrigation purpose. The cost of maintenance of such a sullage utilisation scheme will hardly work out to Rs. 1.25 to 1.50 per capita as against high per capita cost of Rs. 15 to 20 involved in the maintenance of sewerage schemes.

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(11) Conversion of dry latrines into sanitary latrines combined with a well designed and maintained sullage drainage can serve as short term measure to prevent water and land pollution until such time the towns are able to be provided with underground drainage system which is the permanent solution.

(12) Almost all urban towns have some sort of a refuse collection, transportation and disposal system. But the system is grossly inadequate and ill-managed and inefficient. It is necessary to tackle this problem from two aspects to save the urban community from the health hazards and also to take special measures to prevent the workers from the risk and danger of handling the solid wastes in all the connected operations. A strategy has to be evolved for planning and implementation of programmes to deal with solid wastes with multiple objectives to integrate cleanliness of cities and towns with product of 'wealth from waste'. An effective organisation for planning and financing should be set up at national level. A nationwide survey should be undertaken as an immediate step to assess the magnitude and to assist in planning for future course of action. Meanwhile, the present scheme of mechanised composting in selected 35 towns should be completed in the next 5 years and the plants closely studied to assess its suitability and cost-effectiveness and maintenance problems, etc. Similar other

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methods like sanitary land filling, pyrolysis, bio-gas production also should be studied on pilot scale to choose proper methods of disposal suitable to a particular local situation.

(13) The management of solid wastes should be a unified and independent department headed by an engineer with specialisation in solid wastes management, assisted by a team of officers belonging to other disciplines, such as, mechanical engineering, automobile engineering, etc. and the health department should be an independent invigilator of the standard of performance.

(14) There is an urgent need to enact legislation for solid waste management. This may take the form of updating existing Municipal Acts or the introduction of new Act at State or Central level. From experience gained in enacting the Water Act, the legislation at Central level seems to be more desirable.

(15) An effective organisation for planning and financing should be set up at national level for solid waste management and modern management techniques should be employed in the field of solid waste management. In the metropolitan districts of major cities of Calcutta, Bombay, Madras and Delhi, Regional Solid Waste Management Boards be set up for an efficient and economic management.

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(16) High priority given to rural water supply and sanitation during the current plan period, should continue in future plan periods. The present thinking of the Central Government on the strategy for future action with respect to rural water supply to cover all the balance villages in the problem areas with protected water supply during the International Water Supply and Sanitation Decade is sound and should be implemented. But, mere provision of water supply alone will not improve health status appreciably and will also create problem of waste water disposal.

(17) An integrated approach both for water supply and rural sanitation should therefore be adopted.

(a) In all areas where piped water supply is envisaged an integrated water supply-excreta disposal-bio-gas plant - composting - aqua culture and gardening system which is ecologically balanced should be developed.

(b) Similarly where water supply is from spot sources like wells and tubewells, an integrated water supply and waste disposal system with tubewells or wells - household or community latrines - bio-gas - compost pit - farming, as shown in the conceptual frame work (vide Appendix B), may be adopted.

(18) A unitary Agency at the State level should have control over the entire field of activity in rural water supply and sanitation. The State Public Health

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Engineering Department under the Ministry of Health or Local Self-Government is the most suitable agency for this purpose.

(19) Planning for rural water supply and sanitation should be carried out at district level. The Zilla Parishad should be involved in the process of planning. The resource made available to the Zilla Parishad should be allocated by it to Panchayats. The Public Health Engineering Department should execute all water supply schemes and integrated schemes. The Block with additional staff for sanitation work should carry out latrine programmes. The Panchayats should be fully involved initially in the schemes mobilising peoples' participation, both in the form of kind and coin and also finally accept the responsibility of maintaining both water supply and sanitation services. However, the district public health engineering and public health organisation should provide technical guidance to the Panchayats in proper maintenance.

(20) Plan allocations should be stepped up to accelerate both water supply and sanitation and initiate a programme for Rural Sanitation and to cover the set target by 1991.

(21) Detailed investigation in all villages to assess the magnitude of water supply and sanitation problem now initiated by the C.P.H.E.E.O. should be completed expeditiously and project designs and estimates prepared

to arrive at an accurate assessment of the magnitude of financial implication to cover the entire rural population, both with water supply and sanitation. Then a strategy should be worked out for planning integrated development of both water supply and sanitation, and a time bound programme evolved to cover all villages by 2001 A.D. or latest within three decades starting from 1981.

(22) Once a comprehensive planning for rural water supply and sanitation is ready, additional financial resources should be explored. International and bilateral assistances are likely to be received from I.D.A., U.N.I.C.E.F., DANISH, Joint Health Care Programme of W.H.O. and U.N.I.C.E.F. and it may also be possible to raise additional funds from local financial institutions and possibly by issue of debentures.

(23) Setting up of Rural Water Supply and Sanitation Boards, for management of rural water supply and sanitation as an alternative to the organisation as suggested above may also be considered.

(24) Setting up of a Rural Water Supply and Sanitation Corporation at the Centre to deal with policy matters, to pool financial resources from all avenues and to make allocations to the States depending on priorities may also be considered.

(29) Establishment of a revolving fund based on

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national currency and international grants-in-aid or long term loans, which would be continuously enhanced by project revenues and capital repayment.

(26) As already discussed in Chapter III, the existing facilities for post-graduate training and the training of subordinate engineering personnel should be augmented. The present input capacity of 144 be increased to 250. More institutions should be encouraged to start training programmes.

(27) The present stipendary scheme under National Water Supply and Sanitation Programme of Ministry of Works and Housing available to in-service personnel only, should continue and be extended to independent meritorious engineering graduates and diploma holders to attract them to this field of speciality.

(28) Training facilities for plant operators, analysts, of all category be expanded and certification and grading of plant operators and plumbers be introduced. This responsibility should be entrusted to State Public Health Engineering Departments as well as to professional bodies like Institution of Public Health Engineers (India), Institution of Engineers (India), Indian Water Works Association, Indian Association for Water Pollution Control.

(29) A degree or diploma course be introduced in solid waste management to meet the future demand for trained environmental engineers/scientists in solid waste management.

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(30) Short-term and Refresher courses, and Orientation Courses now organised by the C.P.H.E.E.O. at different institutions be expanded and properly distributed in time and space for the organisation to make full use of the opportunities available for continued training.

(31) The National Committee for Environmental Planning and Coordination functioning under the Ministry of Science and Technology be expanded to a high power Advisory Board or Commission similar to Central Water and Power Commission and functions as an independent body to formulate national policy on all environmental factors, and advise the Planning Commission regarding plans and programmes concerning environment. The present C.P.H.E.E.O. may form the executive body of the commission, with a number of wings to deal with various aspects of environment, water supply (urban and rural), waste water disposal (urban and rural), water pollution control, solid waste management, environmental engineering training, environmental control, research and development, water resources management, air quality management, industrial and occupational health, etc. The commission will also act in an advisory capacity to Ministries of the Central Government on all matters on environmental health and environmental protection.

(32) In order than water uses and waste water disposal and recovery and water pollution control be

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looked upon as components of a water resources system. Water Resources Management Boards or Authorities like the Tennesey Valley Authority or ORANSCO be set up for all major river basins, like Ganga, Brahmaputra, Cauvery, etc. Such authorities should function as an independent authority with representation of all the interests as a long term measure.

(35) Adequate financial resources be found for the Water Pollution Control Boards so as to enable the boards to set up suitable infrastructure and laboratories to function more effectively. The cess levied recently may only meet a part of the maintenance expenditure. Air Pollution Act, if and when enacted, be entrusted to these boards so that ultimately the boards could expand their activities for a toral environmental control.

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# CHAPTER V

## Costing Implications

Main difficulty in forecasting financial commitment for future programmes, is costing. Even during the past plan periods, since price levels were rapidly changing more often than expected, the planned projects could not be completed within the budgetary provisions or bottowed monies. This has resulted in increasing back log of works, on the on-going programmes, with the result new programmes could not be taken up and implemented. Unless, the price levels are stabilized at some point, long-term planning and reaching the set goals, in time bound programmes, will be very difficult. Both, cost of materials and labour are continuously rising. Hence, cost estimates based on current market rates even with a fair marginal allowance for market fluctuation may not hold good even after a few years, if the prices go up beyond expectations. Costing is further implicated, because of programme orientation, which may vary from area to area in a vast country like India. However, based on a very rough estimate, at the prevailing unit costs, Table - 16 presents total cost and annual cost involved in implementing the balance environmental health programmes as envisaged in the preceeding chapters.

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## Table - 16 : Cost estimate for provision of environmental health programmes for the future

| Service | Population (crores) Covered | To be covered | Estimated cost to provide services (crores of rupees) Total | Annual | Remarks |
|---|---|---|---|---|---|
| A. Urban | | | | | |
| 1. Water supply | 87 | 118 | 4,800 | 480 | To be completed during water supply decade. |
| 2. Sewerage - Domestic | - | - | 1,300 | 65 | To be completed by 2001 A.D. |
| - Industrial | - | - | 800 | 40 | To be completed by 2001 A.D. |
| 3. Conversion of existing dry latrines to water seal latrines. | - | - | 320 | 32 | To be completed by 1991 A.D. |
| 4. Provision of water seal latrines where there are no latrines. | - | - | 380 | 38 | To be completed by 1991 A.D. |
| 5. Solid waste management (improving collection, transportation & disposal). | - | - | 6,000 | 300 | Annual expenditure |
| 6. Setting up compost plants to produce 10 millions tons by 2000 A.D. | - | - | 1,000 | 50 | To be completed by 2001 A.D. |
| 7. Environmental pollution control. | - | - | - | - | Requires more data collection. |
| B. Rural : | | | | | |
| 8. Water supply | 43.83 | 692 | 10,300 | 500 | Problem villages to be covered by 1985 A.D. and rest by 2000 A.D. |
| 9. Rural sanitation (Integrated Systems) | - | 720 | 2,000 | 100 | More of peoples own efforts and less of subsidy. |
| C. Research and Training | - | - | 2,000 | 20 | |
| | | | 28,900 | 1,605 | |
| | | | say,30,000 | | |

The above cost estimates are only rough and may not hold good, when a correct assessment of existing conditions are available, particularly with respect to rural water supply, rural sanitation, solid waste management, environmental pollution control, etc. However, the Table serves the purpose of indicating the magnitude of financial implications of resource mobilization required. Hence, in order to achieve tangible progress in each sphere of activity in environmental health, it will be necessary to augment research to develop more appropriate technologies to reduce cost and accelerate progress. Besides, community participation in all the programmes right from the conception to the stage of maintenance, should be an essential component of all programmes in order to accelerate progress and also to reduce the burden of cost on the Exchequer. This aspect which hitherto did not receive due attention should be given more emphasis. Social scientists, and social organizations have a big role to play in future particularly in rural water supply and sanitation. An annual allocations to the tune of 1600 - 1700 crores of rupees cannot be earmarked from the general revenues of State or Centre alone. Other financial resources as recommended in the previous chapter should be tapped. A comprehensive planning be worked out covering all aspects and an infrastructure built up on implement these programmes.

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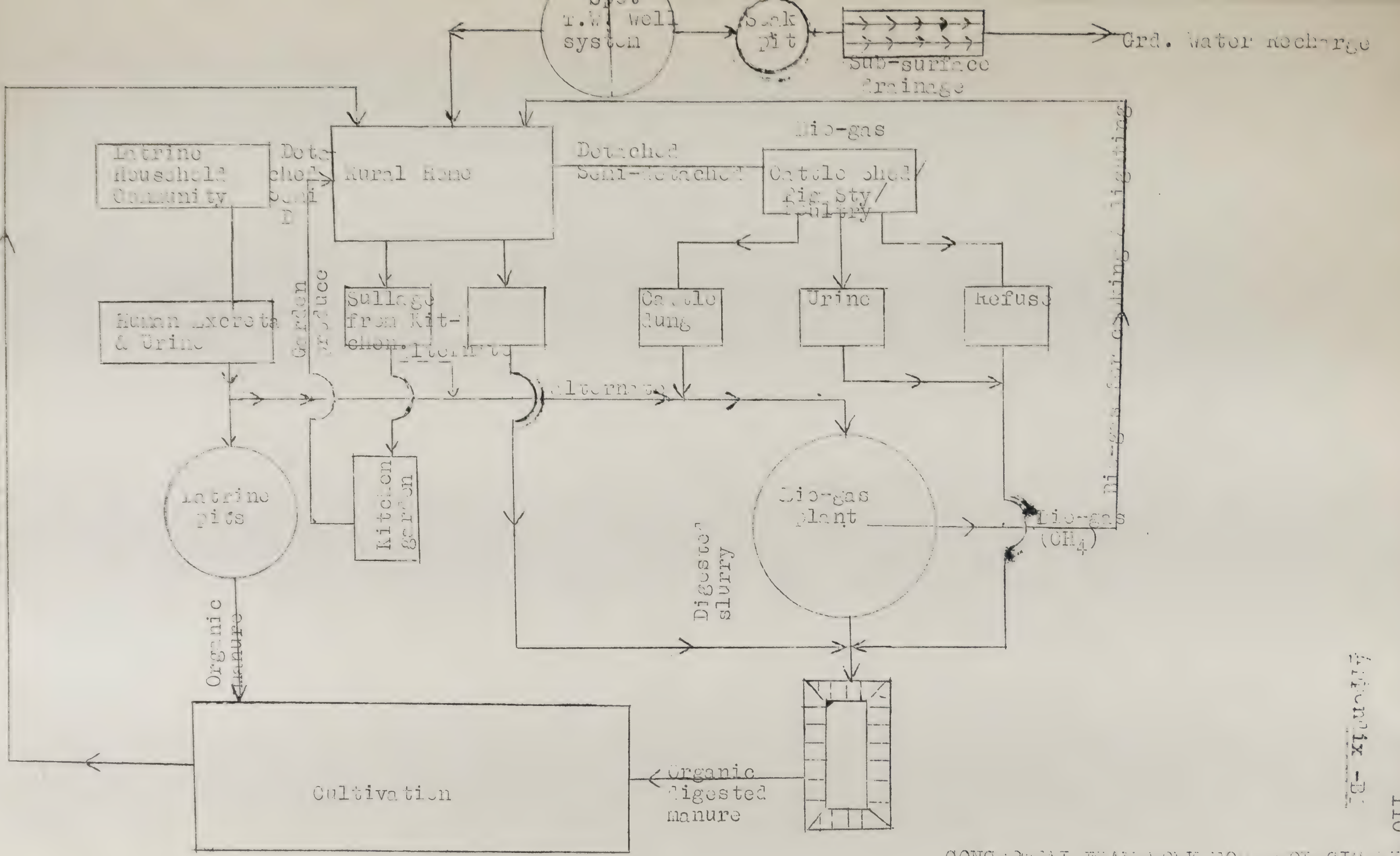
TABLE : STATE-WISE COVERAGE OF URBAN WATER SUPPLY, CONSUMPTION RATES, PERCENTAGE SERVED BY HOUSE-TAPS AND STREET HYDRAUNTS

Source : Status of Urban Water Supply in India - March '78 - CPHEEO.

| Sl. No. | Name of State. | No. of towns | | Population (in lakhs) | | Percent population covered. | Per capita rate of supply Lpd(range). | Percentage served | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total. | Covered. | Total. | Covered. | | | By house taps. | By street hydraunts. |
| 1. | Andhra Pradesh | 224 | 134 | 84.03 | 54.50 | 64.8 | 40-120 | 50 | 50 |
| 2. | Assam | 72 | 17 | 12.87 | 2.05 | 15.9 | 70-135 | 50 | 50 |
| 3. | Bihar | 202 | 138 | 56.34 | 45.00 | 79.9 | 45-100 | 40 | 60 |
| 4. | Gujarat | 216 | 162 | 74.97 | 69.90 | 93.3 | 35-135 | 70 | 30 |
| 5. | Haryana | 65 | 65 | 17.73 | 13.30 | 75.0 | 40-130 | 50 | 50 |
| 6. | Himachal Pradesh | 36 | 35 | 2.42 | 2.38 | 98.3 | 90-135 | 80 | 20 |
| 7. | Jammu & Kashmir | 45 | 45 | 8.58 | 8.58 | 100.00 | 70-135 | 60 | 40 |
| 8. | Karnataka | 245 | 205 | 71.22 | 67.22 | 94.40 | 45-135 | 60 | 40 |
| 9. | Kerala | 88 | 82 | 34.67 | 27.80 | 80.20 | 25-150 | 60 | 40 |
| 10. | Madhya Pradesh | 249 | 174 | 67.85 | 60.38 | 89.10 | 45-200 | 50 | 50 |
| 11. | Maharashtra | 289 | 236 | 157.11 | 149.94 | 95.40 | 35-225 | 65 | 35 |
| 12. | Manipur | 8 | 5 | 1.41 | 0.86 | 60.90 | 45-90 | 50 | 50 |
| 13. | Meghalaya | 6 | 5 | 1.47 | 0.42 | 28.60 | 25-90 | 50 | 50 |
| 14. | Nagaland | 3 | 3 | 0.51 | 0.39 | 76.50 | 45- | 60 | 40 |
| 15. | Orissa | 81 | 64 | 18.45 | 14.50 | 78.60 | 45-115 | 60 | 40 |
| 16. | Punjab | 108 | 68 | 32.16 | 17.12 | 53.2 | 80-180 | 50 | 50 |
| 17. | Rajasthan | 157 | 157 | 45.44 | 45.44 | 100.00 | 40-150 | 50 | 50 |
| 18. | Sikkim | - | - | - | - | - | - | - | - |
| 19. | Tamil Nadu | 439 | 165 | 124.65 | 98.60 | 79.3 | 70- | 75 | 25 |
| 20. | Tripura | 6 | 4 | 1.62 | 1.09 | 67.2 | 40- | 30 | 70 |
| 21. | Uttar Pradesh | 325 | 214 | 123.89 | 102.28 | 82.2 | 50-100 | 60 | 40 |
| 22. | West Bengal | 226 | 89 | 109.67 | 78.97 | 72.0 | 45-90 | 60 | 40 |
| 23. | Andaman & Nicobar islands | 11 | 1 | 0.26 | 0.26 | 100.00 | 70 | 60 | 40 |
| 24. | Arunachal Pradesh | 4 | 1 | 0.17 | 0.04 | 23.5 | 190 | 60 | 40 |
| 25. | Chandigarh | 2 | 2 | 2.23 | 2.29 | 98.3 | 180-95 | 95 | 5 |
| 26. | Dadra & Nagar Haveli | - | - | - | - | - | - | - | - |
| 27. | Delhi | 3 | 3 | 36.47 | 36.47 | 100 | 200-300 | 75 | 25 |
| 28. | Goa, Daman & Diu | 13 | 11 | 2.27 | 2.11 | 92.9 | 100-180 | 60 | 40 |
| 29. | Laccadives | - | - | - | - | - | - | - | - |
| 30. | Mizoram | 2 | 2 | 0.38 | 0.38 | 100 | 10- | 30 | 70 |
| 31. | Pondichery | 6 | 5 | 1.92 | 1.83 | 92.4 | 100-140 | 60 | 40 |
| | Total | 3121 | 2092 | 1090.94 | 904.38 | 82.90 | | 61.3 | 38.7 |




CONCEPTUAL FRAMEWORK FOR ECOLOGICALLY BALANCED WASTE DISPOSAL SYSTEM IN RURAL HOMES.

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